

The Attitudes that New Zealand Chinese and Korean people have toward sharing their
health information in Electronic Health Records in Christchurch.

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Abstract

Benefits of implementing electronic health records (EHRs) are well documented; however, some challenges impede their widespread use. The literature review provided evidence of concerns about privacy and security of information and a lack of full consumer involvement. Healthcare organisations must be prepared to anticipate and manage changes that will accompany the implementation of this new health information management system. With the promotion of EHRs by the US president, the UK government and the New Zealand Government's health Information Strategy 2005 and the setting up of the New Zealand IT Health Plan makes future implementation and use of EHRs very likely. The objective of this study was to investigate the attitudes that Chinese and Korean health consumers in Christchurch hold towards the sharing of their health information in the EHR. The study further investigated how well informed that Chinese and Korean people are regarding the use and security of their health information.

Participants (n=201) from a non-randomized convenience sample were recruited from affiliated and non-affiliated members of the Canterbury Partnership Health Organisation and who lived in the city of Christchurch. The strategy from recruitment was designed to search for people living in Christchurch who identify themselves as Chinese or Korean. The survey instrument, a self-assessment questionnaire, was completed by participants either by pencil and paper or online. Data comprised of subjects' demographics, utilisation of health services and selected measure on perceptions of EHRs (computer use, EHR benefits and problems, and EHR security measures). Descriptive, crosstabulations/chi-square statistics were also evaluated.

The findings of the study showed that neither gender nor age influenced the participants' concerns about confidentiality of information in their medical record. Gender considered an important variable in the cross-cultural populations was relatively a non-significant influence with most of the variables examined except with the participants' awareness of EHRs. Age appeared to have been more influential for participants associations with the selected measures. Computer use was negatively associated with security concerns for health information, that is the more people, used computers the less concerned they were regarding security.

The study findings highlight the general concerns about security, confidentiality and privacy associated with health consumers and their medical records. The significant contributions of this study include the attitudes of Korean and Chinese ethnic groups and the implementation of EHRs. The findings may aid in implementing EHRs in a cultural sensitive manner, for example by (incorporating Yin and Yan; and Qi concepts). Areas of future research were highlighted such as (conducting qualitative research using focus groups or widening the geographic area to include Chinese and Korean people from New Zealand's three or four largest cities such as Auckland). In conclusion the results provide evidence/empirical support on the perceptions of Chinese and Korean people toward EHRs and their medical information.

CHAPTER ONE: INTRODUCTION

1.1 Background

The vision that electronic health records (EHRs) are the technology of the future is no longer limited to a handful of pioneers. The general consensus in the health sector is that paper record system can no longer meet the demands of the modern healthcare. Even those professionals who are not keen to change do understand the potential value of EHRs. The Institute of Medicine endorsed the EHRs as an essential technology for healthcare in 1991

(Dick & Steen, 1991). The benefits of EHRs include improved patient care (Sprague, 2004b; Thompson & Brailer, 2004) improved communication between healthcare professionals and healthcare organizations due to increased record portability, reduced medical errors, increased efficiency of care, immediate access to patient data, reduced costs, links to medical knowledge and clinical decision support, more complete documentation and decision support, and improved legibility, and greater security (Anderson, 1997; Dick et al, 1997; Miller et al, 2004).

1.2 Problem Statement: EHRs, Privacy and Confidentiality.

The use of EHRs challenges the traditional medical principles particularly in terms of access to information. The challenge involves balancing the two competing values of access to information on a “need to know principle” or “authorized and unauthorized” and preserving patient information privacy (National Research Council, 1997). The principle of EHRs is that information should be readily available to health professionals so that they can give patients effective care. However, making this information readily available may create opportunities for unscrupulous individuals. Records may be accessed by inquisitive healthcare workers who do not need the information to fulfil their scope of practice/duty of care related activities. In worst case scenarios access to personal health information may be misused by people in such a way to harm patients emotionally, physically or financially (Shortliffe, Perrault, Weiderhold, & Fagan, 2000). In his State of the Union Address, President George W Bush announced for

electronic health records to “... avoid dangerous medical mistakes, reduce costs, and improve patient care,” and he appointed Dr Brailer as the first National Health Information Coordinator to lead this initiative (Amatayakul, 2004). Dr Brailer resigned in 2006 and since then three people have been serving in this role, Dr Robert Kolodner (2006-2009), Professor David Blumenthal (2009-2011), and Professor Farzad Mostashari (2011- to the present day) ([http://en.wikipedia.org/wiki/Office of the National Coordinator for Health Information Technology](http://en.wikipedia.org/wiki/Office_of_the_National_Coordinator_for_Health_Information_Technology)). The UK Government launched a strategy in October 1998 called “Information for Health” and yearly targets were set for advances in Information Technology (IT) (Royal College of General Practitioners, 2003). The New Zealand government developed and implemented the Health Information Strategy for New Zealand 2005 (HIS-NZ) (Ministry of Health, 2005). This strategy provided the direction for the health and disability sector to improve information management and the sharing of information (Health Information Strategy Steering Committee, 2005; New Zealand Ministry of Health, 2005). This strategy was updated by the National Health IT Board with the launch of the National Health IT Plan in 2010 (National Health IT Board, 2010).

1.3 Population and health demographic indicators

The ageing population, the chronically ill and people with complex needs have highlighted the need for improved information exchange between healthcare service organisations. At present New Zealand healthcare records are both paper-based and in electronic format and are kept at different and sometimes in geographically isolated places. Healthcare professionals tend to keep their own specific records of consultation with the patient. As a result, there is a fragmented picture of a patient’s health history and their present requirements when they visit different healthcare professionals across the sector. The healthcare professionals/clinicians will only record the information that is relevant to their specific requirements without having access

to the full patients' health history. Hence the increased need for, and accelerated implementation of intra-operative EHR systems that aim to improve safety, efficiency and quality of care beyond what is currently possible through the use of paper-based health records or electronic systems.

1.4 Future Directions

During the past four decades developments in information systems were mainly designed for healthcare managers, physicians and other professionals (Greens & Shortliffe, 1990; Lorenzi, Riley, Blyth, Southon, & Dixon, 1997; Shortliffe & Cimio, 2006) However, recent developments have seen information systems extending to consumers and patients (Eysenbach & Jadad, 2001; Eysenbach, 2000; Lewis, Chang, & Friedman, 2005) this branch of medical informatics is called Consumer health informatics. Consumer health informatics analyses consumers' needs for information; educates and implements methods of making information accessible to consumers; and includes consumers' preferences (Eysenbach, 2000).

Following the vision set by the Health Information Strategy New Zealand 2005, the Ministry of Health established the National Health IT Board. The National Health IT Board holds community seminars and discusses access to electronic personal health information (Ministry of Health, 2012b). They are aiming for all New Zealanders and the health care professionals caring for them to have electronic access to a core set of personal information records by 2014. The Ministry of Health has put in place an expert advisory team that will develop a Health Information Governance Framework to support service providers, Ministry of Health (MoH), and the District Health Boards (DHBs) to manage health information securely at local, regional and national levels. This expert advisory group will concentrate on issues such as who should have access to the Connected Health environment and how (and whether) access to some information is permitted by some individuals involved in a person's care but not others (MoH,

2012). Connected Health is a brand name that will be used as an umbrella term for all IT systems and environments that share information securely.

1.5 Purpose of the study

1.5.1 Chinese and Koreans in Christchurch

The term 'Asian' was developed by Statistics New Zealand in 1996. This definition describes people whose origin is the Asian continent (Asian Health Chart-book, 2006). Asians form the largest ethnic group in Christchurch with 26,631 people identifying as Asian in the 2006 census. They make up about 8% of the city's population (Statistics New Zealand, 2006). The Asian population is diverse and is from different countries such as Japan, China, Korea, India, Vietnam, Sri Lanka, Philippines, Malaysia and Cambodia.

Their history backdates to the 1870s when most Chinese population settled in and around gold mining towns of the West Coast of the South Island and Otago. In the decades following the 1890s the Chinese people moved to other parts of South Island making Christchurch city their main destination (Taher, 1970). The changes in immigration policy in the 1980s may have also contributed to the increase of Chinese and Koreans population in Christchurch. The immigration policy that used to be based on preferred source countries changed to a point system that took into consideration a person's age, education levels, work experience and the ability to bring capital into the country (Friesen, 2008).

The age and sex structures of Chinese and Korean population in Christchurch follow the same pattern that is displayed in the national characteristics of Asian population. When the Asian population is compared with that of national total population it shows that the Asian population is relatively young with smaller proportions in the age cohorts above 45 years of age and the youth and adult cohorts aged 15 to 30 displaying a relatively large population

(Bedford & Ho, 2008). The Chinese population in Christchurch shows a great difference from the total population of the Canterbury region. Chinese have high proportions of cohort ages between 20 to 24 years with males at 14.4 percent and females at 12.4 percent of the total Chinese population in Canterbury (Friesen, 2008, p9).

Koreans are the second largest Asian migrant population in Christchurch. Their age sex structure is quite different from that of the general population and also from that of the Chinese population. There are a high proportion of women in the cohort 35 to 49 years who maybe caregivers of school-age international students and in some case their 'astronaut spouse' are working either in Korea or somewhere else (Friesen, 2008). It is important to respect consumers' traditional beliefs and practices (Ngo-Metzger et al 2003).

The purpose of this study is to examine the attitudes that Chinese and Korean health consumers in Christchurch hold towards the sharing/access of their medical information in the electronic health record format (EHR). At the same time the study will also investigate how well informed that Chinese and Korean consumers are about the use of their health information. Such investigations will highlight consumers' issues and needs that provider organisations; care providers; funders and policy makers ought to be aware of when putting together effective information infrastructures for the sharing of health information nationally, regionally and locally. Health consumers' general reactions towards EHRs are positive, however, consumers are mostly concerned about lack of security for the sensitive information contained in these EHR systems

(Hunter, Whiddett, Norris, McDonald, & Waldon, 2009; Payper, Amery, & Crook, 2004; Widdett, Hunter, Engelbretch, & Handy, 2006). It is anticipated that the results of this study will: show how using the EHRs will enhance a safe, accurate and timely communication among health care providers; show that if people are educated and reassured about the security

protocols that are in existence within the use of electronic health records, and they will embrace the use of this domain.

The security issues in EHRs that people are mainly concerned about are:

- Viruses
- Malicious software
- Unauthorised access to system
- Long term accessibility of information
- Hackers/crackers
- Failure to back up the medical record (Question 16)

1.6 Research Hypothesis

The participants' age, ethnicity, highest education attained; literacy in computer use and health states will have an influence on the attitudes and perceptions for the use of personal health information in electronic health records.

1.7 Research Implications

Historically, the only ways available for recording health information were paper and pen, today the sector has multiple choices. These choices include EHRs that have a huge potential to improve information exchange across health care systems. Information is paramount in the effective management of patient care (Garfield, 2002; HealthCast, 2010; C. P. Waegemann, 2002).

Moreover, patients/ health consumers are now considered important stakeholders in health services, at the same time as more and more evolving technologies are utilised. However, although these complex technologies are transforming the health sector they sometimes involve

a high start-up cost. Consumers are now becoming more knowledgeable and are living longer in Western countries as advances in medicine are making more diseases treatable. As a result, the trends cause high demands for the already stretched resources for the health sector

(HIS-NZ, 2005, MoH, 2012). Now there is a significant demand for better provision for the aging population, people suffering from chronic diseases such as diabetes and cardiovascular diseases and emergence of infectious diseases such as H5NI (bird flu); the new technologies such as EHRs enable availability of more effective care but often at exorbitant prices

(HIS-NZ, 2005) The implication of the hypothesis above is that if health information is available at the right place, time and in the right format, there will be good chances for making informed decisions about targeting services for quality of care.

1.8 Aims of the Research

1.8.1 Broad Aims

The study is a cross-sectional survey design that aims to demonstrate associations between Chinese and Korean demographics (age, education, ethnicity, health states and languages) and the perceptions that they have regarding EHR systems with a specific focus towards the areas of security and privacy.

1.8.2 Specific Aims

- 1) To investigate how study population age and ethnicity affects perceptions of computer use (that is, buying and purchasing goods over the internet) and security and privacy issues related to electronic health records.
- 2) To investigate and demonstrate how highest education level attained and health states (pain, anxiety, activity and self-care) affects perceptions of privacy and security issues in EHRs; and

- 3) To discover to what extent consumers understand the use of EHRs and the context of the National Health Index unique identifier.

1.8.3 Expected Outcome

This research will survey and report attitudes held by Chinese and Korean health consumers regarding access to personal health information. These findings will enhance current understandings relating to 1) the specific needs of this population, and 2) the issues involved in the implementation of EHRs in New Zealand more generally, to generate recommendations and strategies for action.

1.9 Summary

The traditional medical paper record system is no longer able to meet the demands of a modern health care system. New Zealand has realized importance of modern information technology in transforming its health care sector and has set a goal to have full interoperable EHR systems by 2014. Information in EHRs is readily available anywhere, anytime and electronic access has its own strengths and weaknesses. There is the potential for intruders (hackers/crackers) to gain unauthorized access to sensitive health information, although this can be prevented by appropriate security protocols and processes.

The purpose of this research is to investigate the attitudes of Korean and Chinese people in New Zealand toward the use of their personal health information kept in EHRs. The argument is that people's attitudes toward EHRs are positive although consumers are concerned about the security and privacy of their sensitive health information (Bates, 2005; Chhanabhai & Holt, 2007; I. M. Hunter et al., 2009; Jha, Doolan, Grandt, Scott, & Bates, 2008).

It is hoped that communities, health and social agencies and policy makers will utilize the recommendations generated in this study to form concrete strategies and actions for the health needs of Chinese and Korean people in New Zealand.

CHAPTER TWO: Review of the Literature

2.1 Introduction

Information and communications technologies represent a major vehicle for modernisation and are rapidly transforming the way people interact in the health sector. Information technologies offer opportunities for a better quality of life. As (Blumenthal & Glaser, 2007) commented:

“Judging from the excited rhetoric of some of its enthusiasts, health information technology (HIT) has the power to transport us to almost a dreamlike world of health care perfection in which the work of doctors and the care of patients proceed with barely imaginable quality and efficiency.”

The reasons for shifting to technology are many. Table 2.1 below highlights the performance of computer-based technology.

Table 2.1. Comparison between human and computer performance

(Source: Landsdale & Ormrod, 1994)

<i>Facility</i>	<i>Human</i>	<i>Computers</i>
<i>Calculation</i>	<i>Slow, error prone</i>	<i>Fast, accurate</i>
<i>Vigilance</i>	<i>Intermittent, prone to fatigue</i>	<i>Permanent</i>
<i>Judgement</i>	<i>Biased</i>	<i>Predictable</i>

The main logic behind the adoption of EHRs in healthcare are time efficiency, better access to services, linking to other healthcare services and the public expectation of a modern healthcare facility (Didham, Martin, Richell, & Harrison, 2004). The unique selling proposition for EHRs is the system's ability to improve quality of care and reduce medical errors. A number of studies conducted confirmed that there were high rates of erroneous and missing information in the health care services (Haughton, 2000; Vincent, Neale, & Woloshynoych, 2000; Wagner & Hogan, 1996). Several countries have realised the importance of technology, UK government set up an implementation policy to make sure that all GPs were computerised (RCGP, 2003). In New Zealand 100% of the GPs are computerised although there is no government legislation for the implementation process (Didham et al., 2004). Instead, a number of recommendations

and reports indicating the importance of IT use in general practice have encouraged the use of computers in the New Zealand health sector.

With the increase in the use of technology in the health sector, EHRs are becoming a reality.

Gillies and Holt state that it is a matter of time before paper-based records systems are converted into electronic systems (Gillies & Holt, 2003). A functional comparison between the two types of medical records will help justify the move from paper-based system to electronic medium. The disadvantages of paper records strengthen the case for electronic health records use.

Table 2. 2. Electronic Health Records and paper-based versions – a functional comparison (Gillies & Holt, 2003).

<u>Function</u>	<u>Paper-based records</u>	<u>Electronic records</u>
Availability	One location	Multiple
Cost	At least US\$500 per lifetime	Tiny individual cost
Security	Low	High
Consumer Control	Low/nil	High – if desired
Data	Difficult to extract	Should be easy to extract
Durability	Low	High
Duplication of records	Yes	No- can all be linked
Duplication of tests	Yes	Rare
Audit trail	No	Yes
Practitioner ‘freedom’	Good	Restricted
Patient interaction	None	Full – if desired

Health information of an individual is of sensitive nature that requires a reliable and secure type of record system. The information kept is usually continuous and extends from “cradle to grave”. The present IT environment has created a conducive breeding ground for information breaches that make health consumers apprehensive about the use of EHRs. In his study, (Annas, 1989) found that patients were not likely to disclose details of any sensitive information freely if they did not trust that their information will not be disclosed to third parties. However, it is in one of the advantages of paper-based record that consumers find solace. The cumbersome nature of paper record make it harder for breach of patient confidentiality to happen frequently as it is hard to search for personal information from stacks of paper in the storage. Although the breach may occur it will not be as magnified as in

electronic records where a single mouse click supplies an instant huge amount of information.

In electronic record system breaches are likely to arise in a less invasive manner making it hard to detect and therefore, more problematic.

The difference between privacy of electronic and paper-based records is illustrated by Lessig (2003) in his book *Free Culture*, where he provided an excellent explanation of the difference between privacy in the physical and in the digital world: “The highly inefficient architecture of real space means we all enjoy a fairly robust amount of privacy. That privacy is guaranteed to us by friction. Not by law [...] and in many places, not by norms [...] but instead, by the costs that friction imposes on anyone who would want to spy. [...] Enter the Internet, where the cost of tracking browsing in particular has become quite tiny. [...] The friction has disappeared, and hence any ‘privacy’ protected by the friction disappears, too.”

Here, privacy can be seen as friction reducing the spread of personal information, that it makes it more difficult and economically inconvenient to gain access to it. However, this definition is putting privacy into perspective which supports the flow of information. It is also reconciling privacy with security targeting them both at setting a level of protection and setting an acceptable level of protection while allowing the development of the digital society and economy instead of focusing on an ideal state of perfect security and privacy (Cremoninin et al., 2009).

(Steiner, 1993) illustrates the advantages and disadvantages of electronic communications as shown in Figure 2.1 below.



Figure 2.1 the iDog

“The online identity is a movable feast. Two canines sit huddled on a computer.”

“On the Internet,” says one, “nobody knows you’re a dog” New Yorker Cartoon, (Source: Steiner, 1997)

The cartoon refers to supposed relative intrinsic of privacy in the sense of anonymity that people can gain by carrying out social relationships on the internet (Cremonini et al, 2009). At the beginning of its history the internet was not seen as threatening to individual’s privacy, it was rather perceived as increasing it as people could easily disguise themselves in the course of personal relationships/communication. Today the belief may be seen as ingenuous with the rise of threats to individual privacy that has accompanied the diffusion of the digital society. However, there could still be some truth in the cartoon because privacy may still be weaker on the internet than in real space as it is technically easier to conceal one’s identity (Cremonini et al, 2009). Definition of the term privacy and details of threats to information are discussed in chapter four of this thesis.

2.2 Medical Records

The idea of electronic Health Records is one that has been raised within the health care industry for over 40 years (Berg, 2004). In 1991, the National Academy of Sciences' Institute of Medicine (IOM), a landmark report "The Computer-Based Health Record: *An Essential for Health Care*" laid the foundations for the EHRs (Carter, 2001). The agreement reached in this report supported the fact that a patient record should be one which comprises of all the information about a patient which would include all healthcare providers that they have encountered at each stage of their history (Dick, Steen, & Detmer, 1997). It is claimed that an EHR system would be a wonderful tool to be an integral part of decision making within health care enterprises in comparison with the passive nature of paper-based record system (Dick et al., 1997). This publication was a result of growing interest in computer-based medical records.

The IOM coined the term EHR system to help in reducing the ambiguities from the evolving acronyms that are synonymously used with the EHRs. This chapter will outline the computerisation of medical records which involves the current issue of the evolving terminologies.

2.3 Paper Medical Record

Some medical records are still paper-based and EHR systems are currently machine-readable versions of paper-based records (Carter, 2001). It is important to know what is meant by a patient record, "The patient record is an account of a patient's health and disease after he or she has sought medical help. The record should usually contain findings, considerations, test results and treatment information related to the disease process." (van Bemmelen & Musen, 1997). The birth of the first known record backdates to the Fifth Century BC with Hippocrates as the

pioneering father. Hippocrates recommended that a medical record should have two main goals that of:

- accurately reflecting the course of disease, and
- Indicating the probable cause of disease.

These goals are still used in the present day medical records but electronic health record systems can provide more functions such as interactive alerts to clinicians, interactive flow sheets, and tailored order sets of which paper-based records cannot do

(van Bemmél & Musen, 1997). The medical record in (Figure 2.2) shows an example of one of Hippocrates' patient records.

'Apollonius was ailing for a long time without being confined to bed. He had a swollen abdomen, and a continual pain in the region of the liver had been present for a long time; moreover, he became during this period jaundiced and flatulent: his complexion was whitish"
After dining one day and drinking to excess, Apollonius "at first grew rather Hot and took to his bed. Having drunk copiously of milk; boiled and raw, both goat's and sheep's, and adopting a thoroughly bad regimen, he suffered much there from."
There were exacerbations of the fever; the bowels passed practically nothing of the food taken, the urine was thin and scanty. No sleep. Grievous distention, much thirst, delirious mutterings. About the fourteenth day from his taking to bed, after a rigor, he grew hot; wildly delirious, shouting, distress, much rambling, followed by calm; the coma come on at this time About the twenty-fourth day comfortable; in other respects the same, but he had lucid intervals About the thirtieth day acute fever; copious thin stools; wandering cold extremities, speechlessness. Thirtieth day: Death

Figure 2.2. Example of Hippocrates' patient record. Adapted from (van Bemmél & Musen, 1997)

The first patient-centred record was adopted at Mayo Clinic in Rochester, Minnesota in 1907.

The notes for each patient were kept in a single file and in no particular order. In 1920, the Mayo Clinic management improved on the previous innovation and agreed upon a minimal set of data that all physicians were compelled to follow. This set of data has become more or less

the framework of today's medical record. Despite the initiative towards standardization of the patients' notes, the notes were still not kept in a satisfactory order. That has led (Weed, 1968) to improve the organisation of patients' notes by introducing a problem- or task-oriented medical record. (van Bommel and Musen, 1997). This was the birth of the patient-centred medical record that has now evolved from the Hippocrates type of unstructured chronological events to today's problem-oriented structured events (Cunningham, 2003).

Paper-based records have some disadvantages that were mainly derived from the medical advancements. Progress in medical knowledge has led to an increasing number of specialisation areas. This has seen a 21st century that has a more mobile and a health conscious patient population that has resulted in a state where patients' medical records are now accumulated in a variety of locations, ranging from their GP to their physiotherapist (Schoenberg & Safran, 2000). It should be noted that each health care provider keeps their own medical records for each of their patients. There is no integration of data from various providers treating the patients. These numerous entry points have resulted in a fragmented "island of information" (Cunningham, 2003). Paper records can only be at one place at a time and sometimes cannot be found at all when clinicians want to use them. Handwriting may be illegible and data may be incomplete and notes may be too ambiguous and hard to interpret. Paper-based records cannot give the care providers automatic reminders, warnings or advice. Retrospective research on paper-based research can be laborious as much data may be missing or useless (Coiera, 2003).

Despite some disadvantages, paper medical records have many things that are regarded as advantages. The paper-based record possesses some remarkable attributes as a physical and informational system. It is portable and easily accessible but nowadays computers are small and portable as well (Coiera, 2003). Notes can be worked on in most places unlike a computer

that requires power to connect to a computer network (Coiera, 2003). Paper and pen are familiar methods of recording information; therefore no special training for medical staff is required. Computer use may require on workplace training for the existing healthcare professionals

(Coiera, 2003). Access to data written on paper can give a very direct feeling; whereas, browsing through quantities of notes permits scanning of what is recorded

(Coiera, 2003; van Bommel & Musen, 1997).

The following (Table 2.3) summarises the advantages and disadvantages that are related to paper medical records. These disadvantages outnumber advantages and may have a potential negative impact on the health and wellness of a patient. The need to overcome these disadvantages has led to the development of electronic medical records.

Table 2.3 Advantages and Disadvantages of Paper-Based Medical Records (adapted from Cunningham, 2003).

Advantages of Paper-Based Patient Records	Disadvantages of Paper-Based Patient Records
Portable	Record can only be at one place at a time
Access is self-contained	Records not always available
Paper & Pen are always a familiar method of information – no special training is required	Record can be ambiguous, illegible or even incomplete
Access to data can feel very direct	Storage of paper consume large amounts of physical space
Records require little structuring	Data relating to one individual may be in varying locations, leading to logistical problems
Paper is relative informal medium, as it imposes few models on the data that is captured	Paper record cannot actively draw attention to anomalies in patient's data
	Paper is fragile, susceptible to damage, and may degrade over time
	Structuring of paper records may be personal, ma become difficult to interpret by someone else
	Absence of formal structure gives rise to increased risk of errors

2.4 The Computerisation of Patient Records

The problems associated with paper medical records have led Medical Institute's IOM to think that paper-based records would be ineffective in providing the best health care. The IOM in 1991 thus proposed for an introduction of information and communication technology into the healthcare. The report indicated that there was a need for an electronic health record that

resided in a system specifically designed to support users by providing accessibility to complete and accurate data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids (Dick & Steen, 1991). This innovation has led to many e-health acronyms being confused and used interchangeably with electronic health record (EHR).

2.5 Acronyms used interchangeably with EHR

Electronic Health Record has become the most used 'generic term' but other terms are sometimes used synonymously. It was thought that these acronyms represent the same concept but this is not true. Each of these terms stands for a specific vision. This section will try and go through some of the e-health acronyms that have been interchangeably used with EHRs. There are many variations of acronyms that are in circulation today as the industry tries to come to a consensus of a definition that can work for all domains. An explanation of each concept may help to clarify the difference of each from the electronic health record. The following contains a list of some of the common e-health acronyms that are used synonymously with electronic health record (EHR):

- Computer-Based Patient Record (CPR)
- Patient-Carried Medical Record (PMR)
- Computerised Medical Record (CMR)
- Electronic Patient Record (EPR)
- Digital Medical Record (DMR)
- Personal Health Record (PHR)
- Continuity of Care Record (CCR)
- Electronic Medical Record (EMR)
- Electronic Health Record (EHR)

(Cunningham, 2003; P. C. Waegemann, 2002).

2.5.1 Computer-based Patient Record (CPR)

The Computer-based Patient Record is the term that was used by Institute of Medicine. The CPR's vision encompasses mainly a virtual computer-based medical record that includes all information (clinical and administrative) and it covers all practitioners that are involved in a person's health care, independent of medical specialties (Weingarten et al., 2002). The CPR also brought up the concept of using the patient record as an integral part of decision support instead of being just a collection of passive information (Brailer & Terasawa, 2003)

CPR raised issues of confidentiality for its vision of a longitudinal health record nature. Many privacy advocates argued that a medical record should only contain information that was relevant to the care of a specific encounter. The discussion on what was relevant did not come to any conclusion. For example, researchers wanted to work with all information of lifetime records while practitioners had mixed responses (too much irrelevant information", "would never look at it," "might be useful") and advocates were rejecting the idea, except in special medical circumstances that had a link to such information (Waegemann, 2002). One politician summed it all when he said, *"I am 65 years old. I do not want my physician to know whether I had a mental breakdown at 16 or an abortion at 19. It does not affect my care now and I resent any plans for a lifelong health record"* (Waegemann, 2002, p2).

Most US vendors, the American Medical Informatics Association, International Medical Informatics Association and CPRI (Computer Patient Record Institute) still use the acronym CPR despite its failure.

2.5.2 Patient Carried Medical Record (PCR)

The Patient-carried Medical Record is an idea that uses a patient as the link to connect to all the health information about them. A good example of this illustration is a patient card in the form of a smart card or a data chip technology such as optical stripes, magnetic high density stripes

or 3-dimensional bar codes for the continuity of care. During the late 1980s the vision was a failure because of technical card problems, issues with capacities, problems with interoperability concerning content and terminology, and lack of infrastructure that would allow providers to record and read the cards (Waegemann, 2002).

2.5.3 Computerised Medical Record (CMR)

The Computer Medical Records (CMR) represents document imaging in the form of EHRs.

Paper documents that are created either through handwriting or transcription can be transferred into digital form with image scanning, optical recognition (OCR) scanning, or hybrid systems.

The advantage of using this system is that it is possible to share patient information with other organisations even when they are created in paper formats. (Waegemann, 2002). CMR guarantees a higher level of document integrity than found in current computer systems regarding signature, persistence in storage, and other integrity features. CMR systems can be successful within a specialized organisation where workflow can be altered and the benefits of having an electronic image of documents outweigh the disadvantages. However, CMR is not regarded as a “natural stepping stone” to EHR applications (P. C. Waegemann, 2003).

2.5.4 Electronic Patient Record (EPR)

(Boaden & Joyce, 2006) describe the Electronic Patient Record (EPR) as a record of periodic care provided mainly by one institution. That institution could be an acute hospital, health care provider of mental health or specialist units. However, some people consider EPR to be synonymous to CPR but the vision of EPR is that relevant patient information differs from case to case. For example “normal” results may not be stored but the data that influence the care process will be part of EPR (Waegemann, 2002). The person centred electronic patient record has the requirement of interoperability that is difficult to satisfy as in EHR system (Waegemann, 2002).

2.5.5 Personal Health Record (PHR)

The electronic Personal Health Record (PHR) is a person-centred system designed to track and support health activities across one's entire life experience; not limited to a single organization or provider (Clarke & Meiris, 2006). PHR is a concept that has existed for many years with consumers maintaining paper PHRs to facilitate transfer of information between health care providers and to ensure that comprehensive information was available for future care (Waegemann, 2002). The electronic PHRs will allow medical information (e.g. radiology testing, discharge orders, medication) to be updated automatically and are also consumer controlled and Internet accessible (Clark and Meiris, 2006).

Unlike the EMR that is tied to a provider office or a specific hospital, PHRs operate from multiple sources and they create a well detailed lifelong medical history and allow consumers to grant access rights to others based on type of provider or type of information

(Wegemann, 2002). There are numerous PHRs online and some health care providers and consumers do not welcome the use of PHRs as they distrust them (Waegemann, 2002).

2.5.6 Digital Medical Record (DMR)

A digital medical record (DMR) is an XML- web based technology that works on a 'pull' technology rather than a 'push' technology (Waegemann, 2002). The system requires the patient information to be posted on the website of the provider or health plan. The information can then be accessed by healthcare professionals rather than send as a message. The DMR can perform the same functionality as EMR, EPR or EHR.

2.5.7 The Continuity of Care Record (CCR)

It is designed especially for the EHR environment to communicate important pertinent communication among authorized providers (ASTM, 2005b).

CCR is defined as “A core data of the most relevant administrative, diagnostic, and clinical information about a patient’s healthcare encounters. It provides a means for one healthcare practitioner, system, or setting to aggregate all of the pertinent data about a patient and forward it to another practitioner, system or setting to support the continuity of care” (ASTM, 2005b).

The standards for the content of CCR are very important to the EHR itself, as they help practitioners who share information to know exactly what data is available and software that can be developed by vendors to support the CCR. The standards specification for CCR were developed and released by ASTM under the sponsorship of 11 technology and physician groups in order to:

“Enhance patient safety, reduce medical errors, reduce costs, enhance efficiency of health information exchange, and assure at least a minimum of standard of health information transportability when a patient is referred, or is otherwise seen by another practitioner” (ASTM, 2005b).

The important key for access to a CCR is accurate patient identification. The practices gather consistent patient identification and demographic information that will permit sharing of patient data across multiple care providers. There are two options that exist for maintenance of the CCR data. The first is to retain formatted data within the practice EHR until access is requested; the second option is a network CCR that is developed under the guidance of the encounters who participate in and contribute to it. Confidentiality and security are always a priority for whichever option is chosen (Maki & Patterson, 2007).

However it should be noted that CCR is not an EHR. It is not a person’s complete health record of a lifelong health status nor is it universally accessible. The patient has no control of the system and essentially feels left out (ASTM 2005). As a result, ASTM and its collaboration

members have taken note of this and are trying to add in “*complementary and alternative medicine care documentation or other patient considerations such as private or sensitive information a patient may be reluctant to share with certain practitioners or spouses.*”

(ASTM, 2005).

So far, the CCR is regarded as a success in comparison to other systems as it has been found to be relevant in the form of its interoperability and transportability to healthcare providers, patients and vendors (ASTM, 2005a, 2005b; Sprague, 2004a; C. P. Waegemann, 2004).

2.5.8 Electronic Medical Record (EMR)

The Electronic Medical Record has been interchangeably used for CPR, EPR or EHR

(Coiera, 2003). It is viewed as the same by both health care professionals and patients. Dick and Steen (1991) defined EMR as ‘*an electronic patient record that resides in a system specifically designed to support users by providing accessibility to complete and accurate data, alerts, reminders, clinical decision support systems, links to medical knowledge and other aids.*’ Carter (2001) and (HIMSS, 2003) regard EMR as being reasonably synonymous with EPR and CPR as they are all machine readable versions of the data found in paper-based records and they all comprise structured and unstructured patient data from computerised ancillary systems and document imaging systems. Therefore, EMR is regarded as the solution between the EPR and the CPR, as it provides the interoperability requirements of the CPR while performing the functions of EPR by allowing communication between systems from different locations and settings (HIMSS, 2010).

The difference of EMR system from EPR and CPR systems is that all healthcare providers using EMR are able to access and input various pieces of information via a computer thus enabling them to work in a paperless environment (Cuningham, 2003, Coiera, 2003). The

EMR can combine text, health codes and images ranging from referring letters to the CAT scans in a single electronic document. Many of the systems discussed above have been developed and adopted in various hospitals and clinics and they are only used within these organisations individually. Figure 2.3 below shows that: electronic medical record has a variety of potential functions that it can fulfil and that require different degrees of investment and technological sophistication to implement them (Coiera, 2003).



Figure 2.3 Functions of EMR. Adapted from Coiera (2003)

2.5.9 Electronic Health Record (EHR)

The EHR is the term that is generally used to describe the concept of “a longitudinal record of patient’s health and health care –from cradle to grave. It combines both the information about patient contacts with primary health care as well as subsets of information associated with the outcomes of periodic care held in EPRs”(NHS, 1999).

The Electronic Health Record (EHR) is the term being used by the majority of people as a 'generic' term for electronic medical records and any of the described terms above. The EHR

The Electronic Health Record (EHR) is the term being used by the majority of people as a 'generic' term for electronic medical records and any of the described terms above. The EHR focuses on relevant health information for current and future use whereas CPR focuses on pre-natal to post mortem, financial and administrative information as was stated earlier

(waegemann, 2003). CPR may also contain confidential information that may be controversial as discussed above. When compared with CMR, the EHR concept aims at empowering the patient as well as allowing for interactive information recording (Grimson & Grimson, 2002), but CMR is not capable of doing this. It is a passive image of a patient's paper medical record at a given time (Waegemann, 2003). The Patient Carried – Medical Record (PCR) system allows patients to carry around their own personal record on a smart card but EHRs can be accessed from any geographical position by anyone who is authorised to read the record therefore alleviating the problems faced with smart cards as discussed above. The EHR system includes both the patients and the health care providers. As the PCR systems use the patients to connect to all the health information about them it is likely that the information would not be accurate. There is need for accurate, complete collection of information that can be provided with the inclusion of healthcare providers if the wellbeing of the patient is to be maintained.

The EPR system is similar to CPR but does not necessarily contain a lifetime record and does not include a dental, behavioural, or alternative care but it focuses on relevant information. In comparison with EHR, an EPR is a periodic care that is provided by one institution whereas EHR describes the history of a person from cradle to grave and is universal (NHS, 1999).

2.6 Summary

The history of medical health record and its progression from paper records to electronic medical records and to the current ‘generic’ electronic health record are discussed. The development of structured medical health system during the 1960s has evolved to the current electronic health record system. The chapter also deals with the common acronyms that have been interchangeably used with EHRs. The investigated acronyms include CPR (Computer-Based Patient Record), which is a person’s life time record that encompasses all information from specialities requiring full interoperability and its vision is unlikely to be achieved in the foreseeable future (Waegemann, 2003). The PCR (Patient-Carried Medical Record) is a record with all its information contained on a token or card that a patient carries but most trials and tests have not been successful. CMR (Computerised Medical Record) is a term that refers to any document - imaging system. The EPR (Electronic Patient Record) is similar to CPR but does not necessarily contain a lifetime record but focuses on relevant information that is provided mainly by an individual institution (e.g. specialist unit or mental health trusts). DMR (Digital Medical Record) is a web-based medical record that uses “pull” rather than “push” technology. The PHR (Personal Health Record) is a system managed and controlled by patient and is mostly web-based. EMR (Electronic Medical Record) is a system that has full interoperability within an enterprise (clinic, hospital or practice). CCR (Continuity of Care Record) is especially designed for EHR to communicate important pertinent communication among authorised providers. The EHR (Electronic Health Record) is the generic term used for all electronic care systems.

Each acronym has its own functional category in the health care service and has its own associated technology and system assigned to it. Thus using these acronyms interchangeably would be unadvisable as it would alter the whole meaning of the overall definition and objectives of the system. This has been highlighted in the last section (section 2.4), where each

system was compared to EHRs and the major differences in each system were outlined. It is important that health consumers, health care providers and other organisations are aware of the different acronyms in use so as to enhance accurate and consistent communication and ensure that common objectives and goals are being accurately communicated.

The definition of “EHR” adopted in this study is:

“The electronic health record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates and streamlines the clinician’s workflow. The EHR has the ability to generate a complete record of a clinical encounter as well as supporting other care – related activities directly, or indirectly via interface including evidence-based decision support, quality management, and outcomes reporting” (HIMSS, 2010).

This definition encompasses the methodology and the ideas that are reviewed in this thesis.

CHAPTER 3: WHAT IS AN EHR SYSTEM?

3.1 Introduction

Chapter Two focused on the progression from paper to computerised medical records. Various acronyms and interchangeable concepts related to EHRs were discussed. This chapter aims to introduce the health consumer informatics perspective and will then move on to discuss the components, core functions, benefits and barriers for implementation of EHRs.

3.2 Consumer Health Informatics

Over the past few decades, the healthcare sector has experienced a dramatic shift in consumer involvement. The health consumer has become an active participant in decision making about their own health and the health of their family members. The use of the internet and the searchable world wide web have revolutionized lay persons' and healthcare professionals' access to information (Lewis, Eysenbach, Kukafka, Stavri, & Jimison, 2005). As from the Hippocratic time, health care for patients was delivered primarily from the perspective of the medical fraternity (Eysenbach, 2000). During that time patients looked to their health care providers as the only source of information on health and disease. Although this approach was valuable in reducing access to 'misinformation,' it positioned the consumer into a "least engaged role" (Lewis, Eysenbach, et al., 2005). The emphasis today is on involving consumers in the process of health care, with positive impact on consumer outcomes (Lewis et al., 2005). This paradigm shift from physician- centred to patient- centric care; accompanied by the ability to access health information on the Internet has become the basis for the development of consumer health informatics.

Figure 3.1 below illustrates this development.

Figure 3.

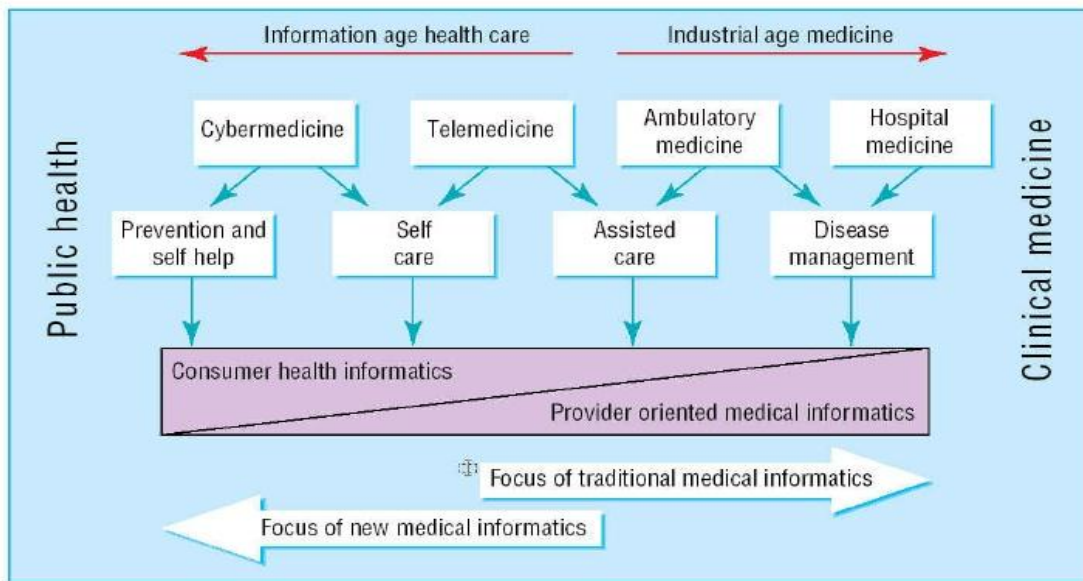


Figure 3.1. The Development of consumer health informatics (Source: Eysenbach, 2000).

Consumer health informatics arose from changes to the roles of patients and providers.

Healthcare is now not contained in a building or an office but can now be found in activities at home, at the gym, at work and even at the food store. Technology is increasingly empowering patients and patients are now expecting more personal attention (Kaplan & Brennan, 2001).

Eysenbach (2000, p. 3) defines consumer health informatics as, “the branch of medical health informatics that analyses consumers’ needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumers’ preferences into medical information systems.” Ferguson (2002) defines consumer health informatics as “the study, development and implementation of computer and telecommunications applications and interfaces designed to be used by health consumers.”

Although these two definitions are not comprehensive, they acknowledge the importance of computers and information technology to support the process of health information delivery in an integrated manner.

The literature discussed above shows that healthcare is now in the process of shifting to a patient-centric model. The consumer/patient is now an active partner and a successful partner requires open access to healthcare information. The creation and implementation of EHR systems is at the centre of addressing this need (Mantas, 2002; Wang et al., 2003).

When the Institute of Medicine conducted a study on patient records in 2003, they gave a concise definition of the vision of the EHR as a system that:

- ❖ Collates data from multiple sources;
- ❖ Is the primary source of information at the point of care; and
- ❖ Provides decision support for evidence - based health care.

Achieving such a vision has been a huge challenge because there is no standard definition for an EHR system. The IOM (2003) has identified eight core functionalities of EHRs:

- ❖ Health information and data;
- ❖ Results management;
- ❖ Order entry/management;
- ❖ Decision support;
- ❖ Electronic communication and connectivity;
- ❖ Patient support;
- ❖ Administrative purposes; and
- ❖ Reporting and population health management.

It was recommended by the IOM that these functions be woven into the more comprehensive EHR system. They were derived after the IOM had established the primary and secondary uses of this system. These uses were identified as:

Primary uses

- Patient care delivery;
- Patient care management;
- Patient care support processes;
- Functional and other administrative processes; and
- Patient-self- management.

Secondary Uses

- Education;
- Regulation;
- Research;
- Public health and homeland security;
- Policy Support (IOM, 2003)

3.3 Core Functions of EHRs

3.3.1 Health Information and Data

EHRs need to contain certain data about patients. Clinicians require this patient information data to make concrete decisions. Being capable to display previous laboratory tests results can reduce the number of unnecessary tests and procedures dramatically. With all these changes, efficiency and quality of care will increase (Blumenthal & Glaser, 2007) Tierney et al., 1998). Readily available patient information such as allergies, medication alerts and reminders can reduce the number of medication related errors and improve the prescribing practices of

clinicians (Kuperman et al., 2001). EHRs that include health information and data sets such as clinical narratives, laboratory tests, nursing diagnoses and medication lists can insure access to information is available to clinicians when they need it (Bates et al., 2003). However, too much information and data can overwhelm the end user therefore, health information and data capture in EHRs need to evolve and keep up with time.

3.3.2 Result Management

Managing results (for example, radiology procedure results, and laboratory tests) electronically have an advantage over paper-based reporting. Having previous test results available in EHRs reduce redundant and repeat testing. The result is improved efficiency and decreased costs (Bates et al., 2003; Shea et al., 2002). EHRs with result management can afford multiple clinicians access to electronic patient consents and consults, giving critical linkages and improving coordination of care among these clinicians and between patients (Bates et al., 2003).

3.3.3 Order Entry/Order Management

A computer physician order entry (CPOE) is a form of patient management health technology software used for providers' medical orders into computer system (Cowan, 2004). EHRs with CPOE software can improve workflow processes by eliminating lost orders and ambiguities caused by illegible handwriting, monitoring for duplicate orders and generating the related orders automatically, and reducing time to fill orders (Mekhjian et al., 2002). Therefore, CPOE will result in financial benefits. It reduces the amount of money spent on pre-printed forms, assures prescribing practices are consistent with organizations' established formats and informs clinicians about cost saving options and duplicate test orders (Butter & Bender, 1999).

Bates & Gwande (2003) researched on CPOE with decision support and found that it reduces the number of non-intercepted medication errors by 83%.

3.3.4 Decision Support

Decision support are systems that will enhance clinical performance in terms of preventing prescribing of drugs, diagnoses, management and detecting adverse events and disease outbreaks. Recent studies have reported positive outcomes on using decision support tools (Bates & Gwande, 2003; Hunt et al, 1998) and found that more support tools such as artificial neural networks can detect acute myocardial infarction, breast and cervical cancer. Decision support tools can improve clinical compliance with the use of established evidence-based guidelines and protocols (Morris, 2003; Starmer, 2000). However, other studies (Eccles et al, 2002; Rolleman et al, 2002) did not find improvements as a result of the use of support tools.

3.3.5 Electronic Communication and Connectivity

Clinicians need to exchange electronic personal health information with colleagues in referral relationships and with laboratory and pharmacies as part of ‘seamless’ service delivery (Klein, 2004). Electronic communication and connectivity processes enhance quality of care and patient safety; and improve public health surveillance (Schiff et al., 2003; Wagner et al., 2001). These processes are important for EHRs especially, when used for patients with chronic condition who have multiple providers in multiple settings needing to coordinate care plans (Wagner, 2000).

E-mail and web messaging have proven to be effective in facilitating communication among providers and between patients, allowing for continuity of care (Liderman & Morefield, 2003). Telemedicine and home monitoring have also proved to be successful communication tools for both providers and patients (Rosenfield et al, 2000; Rogers et al, 2001).

3.3.6 Patient Support

EHRs with patient support processes make patient education available so that patients can obtain information about their health issues when they need it. According to Waingarten et al. (2002), patient education has shown significant effectiveness in improving control of chronic diseases. Krishna et al. (1997) conducted 22 clinical trials and found that interactive education interventions produced positive results for major clinical applications (for example, diabetes). Several studies have also shown that home monitoring by patients is feasible (Johnston et al., 2000; Rogers et al., 2001). Patients are empowered to take charge of their own health (Sinha et al, 2012).

3.3.7 Administrative Processes

EHRs can also incorporate administrative tools such as scheduling for admissions, outpatients and inpatients procedures, and visits. The uses of these tools result in improved efficiency of clinical practices and timely services to patients. (Everett, 2002; Sinha et al., 2012; Woods, 2001). Insurance companies also benefit from administrative tools as these tools are able to provide insurers' clients with online access to reports derived from their claims data. An EHR system with administrative tools will include lists of medical problems and medications and reminders about pending preventive care services (Blumenthal and John, 2007). Other potential uses include reporting tools that can aide in locating matching donors for vital organ transplants

(Chhanabhai and Holt, 2006).

3.3.8 Reporting and Population Health Management

“Because of its frequent patient-centred approach consumer-health informatics may have an even stronger overlap with public health” (Houston, 2001). As Houston commented, the push towards consumer health informatics has encouraged a move towards public health. At present,

most healthcare organizations conduct their routine reporting of key quality indicators to clinicians as abstracted from claims data, paper records and surveys that are sometimes labour intensive and time-consuming (Bates et al., 2003). Use of EHRs with interoperable clinical data in a machine readable format will reduce significant data collection burden for researchers. Patient safety and disease surveillance will become easier to report to relevant departments so that any potential epidemics and suspicious symptoms can be isolated and managed appropriately and efficiently (IOM, 2003).

3.4 Dimensions of EHRs

The implementation and standardisation of an EHR will make clinical data easier to collate and analyse. The less expensive and more accurate the data becomes the more significant is the health focusing. The aim of the core functions as recommended by the IOM is to provide a blueprint for the development and the architecture of an EHR system. Implementing these functions in the EHRs make the system more complex. The importance of functions was supported by Waegemann, 2003, and has helped in the development of an alternative approach, that is, a model of ten dimensions that comprise the EHR system. The aim of this EHR system is to have full interoperability among all speciality and provider domains; therefore, the ten dimensions can be regarded as the basis for interoperability (US HealthIT, 2012).

The level of complexity of each of the ten dimensions defines the concept of the EHR system. The EHR system can take a very simple or very complex state in each of the ten areas (Waegemann 2003). Figure 3.2 below illustrates the ten dimensions of EHRs:

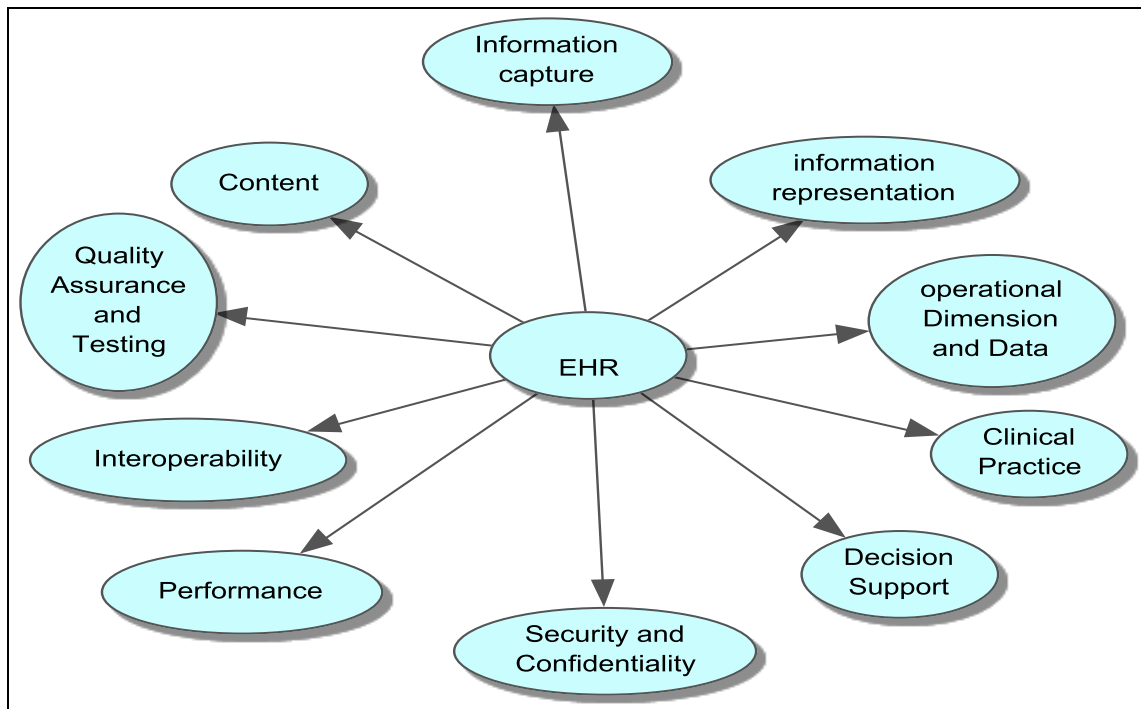


Figure 3.2: Ten Dimensions of the EHR system. (Adapted from Waegemann, 2003)

The functional requirements of the ten dimensions are regarded as a challenge to be met by the healthcare sector (IOM, 2003). Table 3.1 below shows the detailed purpose of each dimension.

Table 3.1 The ten dimensions of EHRs and their purposes. (Source: Waegemann, 2003)

Dimension	Purpose
Information Capture	Integrating handwriting, transcription, speech, imaging and all information passed about a consumer's condition to comply with principles of documentation.
Information Representation	A standard has to be developed to represent terminology that is universally understandable in any context.
Operational Dimension and Data Modelling	Identifying all the people involved in the actions and processes that are covered in a care setting. Understanding relationships and ensuring these are modelled into the system.
Clinical Practice	Standards of care and practice protocols, ensuring practices have care plans and critical paths that are easily followed and addressed by the EHR.
Decision Support	Aides for providers and consumers to ensure the best possible care plan is administered established through robust algorithms and logical support.
Performance	Drawing up performance standards and ways to measure the performance of the system.
Interoperability	Ensuring the EHR domain maps successfully with all providers and consumers.
Quality Assurance and Testing	Systems testing and operational quality assurance maintained through standards and quality measures, testing and evaluation.
Content	Ensuring the right information is recorded as well as the scope of the information and different speciality
Security and Confidentiality	To ensure that there is free access to information and protection of patients' privacy and confidentiality.

These ten dimensions and the eight core functions of EHRs and their uses were also proposed during the Institute of Medicine earlier report of 1997.

3.5 Benefits and Barriers of implementing EHRs

3.5.1 Benefits of EHRs

Modern patient health records are associated with many functions. The records are no longer used only for patient care, but for multiple purposes such as legal and financial information, research and quality improvement. As a result, information can now be shared among many professionals who form the “healthcare team” (Young 2000). An EHR system allows sharing of patients’ information among these multiple healthcare providers. It also, enables point-in-time data insertion, update and retrieval and therefore, provides immediate access of patient data from specialty centers whenever it is required. This helps healthcare providers to make timely decisions for better patient care (Dick et al. 2003; Schoeffel et al. 2001). The availability of health information such as family medical history, past medical history, and immunization through EHRs helps in taking preventive measures and managing chronic diseases effectively.

One outstanding advantage of an EHR system is the ease of maintaining health information of patients/consumers. The system enables paperless medical treatment with less physical space needed for patient health data storage. With good backup policies, an EHR system can have a much longer lifespan. This results in reduced costs of storing, maintaining and generating patient information data in healthcare organizations (Dick et al. 2003; Young, 2000).

An EHR system operates in large healthcare organizations that have a number of specialty departments including laboratories, training and research centers. The EHR system assists in improving clinical processes or workflow efficiency across these units of healthcare facilities. For example, it enables a physician to see progress of treatments, a nurse to report an adverse reaction, an administrator to carry out billing and a researcher to analyse efficacy of medication

on patients (Young, 2000). Therefore, EHR systems promise to improve the overall efficiency of health care in complex environments.

As a management tool, EHR systems help to decrease reporting and charting time during treatment, therefore improving quality of care (Bates et al, 2003; Cohen & Shabo, 2001). EHRs have built in intelligences such as recognizing abnormal lab results or potential life threatening drug interactions (Koeller, 2005). The research results supporting the diagnostic tests and the EHRs are able to link the clinician to the protocols, care plans, literature databases, critical parts, pharmaceutical information and other healthcare knowledge databases (Young, 2000). All this supports an EHR system in improving risk management by enabling accurate diagnoses. The fact that health information data is available from all healthcare organizations at a 'click of a mouse button' helps healthcare providers to refer to the required tests thereby, avoiding repetition of expensive tests; as a result delivery costs are reduced (Dick et al. 2003). An EHR system is also able to achieve better safety through the application of security mechanisms including access audit and authorization control as compared to paper-based.

3.5.2 Barriers affecting EHR System Implementation

An EHR system deals with a variety of healthcare applications and various types of healthcare providers. Hence, its implementation is of a level of complex that more time and effort are required to implement it than any other IT application. Some of the major barriers to implementing EHRs include (Sinha et al., 2012):

- Confidentiality and security;
- Change in clinical workflow;
- Unique Identification;
- Interoperability ;
- Return on Investment (ROI);

- Use of standards;
- Difficult to operate/learning curve; and
- Ethical and legal barriers

As previously mentioned, often multiple providers are involved in the treatment of a consumer via the use of EHRs. Therefore, implementation of an EHR system in an organization often requires significant changes in the clinical workflow. It is always a good thing to make an EHR system a part of strategic vision of the organization (Hamilton, 2011) Designing the system requires involvement of clinical staff and the inclusion of the organization's workflow processes and policies (Hamilton, 2011).

The start-up costs of an EHR system can be very high making it difficult for healthcare providers to implement. As Dick et al. (2003) note, "at the time when healthcare organizations need to reduce their costs, allocating capital to information systems is still a challenge." An EHR system usually provides intangible profits. These profits include patient safety, improved quality and patient care, more efficient tracking of consumer data, better audit of accessed information and improved documentation (Dick et al. 2003). An EHR system also affords some return on investment (ROI) such as reduced material costs, for example, charts, paper, printing supplies and an increase in income with the expanded patient load as a result of time efficiencies. Persuading organizations' decision makers to invest in an EHR system basing on the argument of intangible benefits or related savings can prove to be difficult (Waegemann, 2003).

Confidentiality and privacy issues need to be considered carefully when implementing an EHR system. This is because healthcare providers are concerned about the alteration of EHRs without their knowledge and consumers are concerned about unauthorized access to their private health information data. An EHR system must also meet the security and privacy

regulations for health data that are imposed by regulatory bodies in the country. This assures consumers and providers that the health data is stored securely and privacy is maintained while systems deliver required services (Gurley, 2004; Young, 2000). The system should be able to audit log the access granted to the EHRs with strict access policies. An EHR system must also handle with great care all the ethical and legal issues that are linked to confidentiality, accuracy and access rights of healthcare data (Sinha et al. 2012).

The issue of unique identification needs to be recognized and handled carefully in an EHR system. Duplication of EHRs is a significant issue, which arises because each organization has its own registration process and consumer healthcare data is often collected from various healthcare organizations (Sinha et al. 2012). In the registration process each organization assigns different identifiers to the same consumer. While such data is being integrated, an EHR system should link all data of a specific consumer properly to create a single EHR.

The EHR system links consumers' healthcare data generated from different healthcare systems. Therefore, it should be able to integrate data from such systems while enabling interoperability across the different healthcare applications and systems that are developed independently (Schoeffel et al. 2001).

In order to support interoperability and information sharing across healthcare systems and applications, an EHR system requires compatibility with standards such as clinical vocabulary and standardized data formats (Young, 2000). Diverse healthcare applications usually offer diverse sets of features supporting different structures and data formats. Furthermore, these applications are not usually compatible with data integrity standards and security

(Schoeffel et al., 2001). Therefore, an EHR system should make consistent use of standards and also, upgrade to newly developed standards on a regular basis.

There are still some admirable advantages of paper-based records over EHRs. For example, paper-record systems offer more flexibility in terms of writing a text and inserting diagrams because they are less structured. Reading text on paper is forty percent faster than reading text on a computer screen (Lewis, 2009). Despite all the issues discussed above, the move from paper-based to EHR is certain. The whole world is moving towards it as key issues are gradually addressed (Sinha et al. 2012).

3.6 Standards

Perceptions of EHRs vary between end-user groups, adding to the problems of implementing this technology (Gagnon et al., 2009). For an EHR system to succeed it should have common standards that can be utilised by all participants in the health care sector. The use of standards in EHRs is a priority (Dick et al, 1997). Currently there are three major organisations that are actively involved in the creation of standards relating to EHR systems (Cohen & Shabo, 2001). The leaders and recognised organisations in EHR system standards development include ASTM E31, CEN TC215 and HL7. HL7 is responsible for developing the data exchange standards that are commonly used in North America (Cohen & Shabo, 2001). CEN TC215 is responsible for developing standards for healthcare information technology in Europe and it does so for a group of 19 member countries (Cohen & Shabo, 2001). However, there are other organisations (e.g. International Organization for Standardization (ISO) and OpenEHR). So far ISO has released technical documentation in regards to the EHR domain's definition and model (ISO TC 215 and ISO 18308) while OpenEHR has provided standards relating to public specifications of implementations that support open development sources of EHRs (Cohen & Shabo, 2001). CEN TC215 and HL7 are collaboratively working towards achieving global interchangeable and technically identical standards for EHRs (van Bommel & Musen, 1997; Cohen & Shabo, 2001). Health care sector's hopes are that as both organisations work in

collaboration with the ASTM they will be able to create a draft, that is interchangeable and technically identical (Cohen & Shabo, 2001).

As long as the development of a standardised common language that can be understood by an EHR system does not exist, healthcare information is going to be found in disparate locations in the modern computers. There is need for a common language for health care vocabulary and terminology and an easy to understand message exchange between clinicians. The development of standards is beneficial in this regard because standards provide common descriptions and formats as well as definitions of medical concepts and codes. There are currently four popular coding schemes that support the delivery of care information systems and are used by HL7, CEN T215 and ASTM E31 (Cohen & Shabo, 2001; HealthConnect Taskforce, 2000).

3.6.1 International Classification of Disease (ICD)

The inception of ICD dates back to 1839 when it was developed by a number of pathologists in England and Wales. At first the acronym represented International List of Causes of Death (WHO, 2010; Coiera, 2003). It has evolved and was further revised by the National Centre of Health Statistics in the US and was also based on the World Health Organisation (WHO) classification of diseases, hence the present acronym (ICD). The coding scheme (ICD) is highly recommended for use by clinicians on a daily basis and is believed to be more reliable since it has been in use for a long period of time (WHO 2010). Common coding schemes such as ICD ensure that the EHRs follow paper records systems. However, Coiera (2003) feels that a lot of adjustments to ICD have been done in order to meet the needs of differing statistics applications beyond morbidity and mortality (for example, social security).

3.6.2 Systematised Nomenclature of Medicine (SNOMED).

SNOMED was developed and published by the College of American Pathologists (CAP) in 1979. It is made up of two coding systems namely SNOMED TC (Reference Terminology) and

SNOMED CT (Clinical Terms). SNOMED CT supports the electronic retrieval, storage and analysis of clinical data. SNOMED CT may find it difficult to compare similar concepts that have been indexed in different ways (Rothwell, 1995). However, SNOMED RT works to solve this problem (Coiera, 2003). SNOMED RT is designed for use in software applications such as electronic patient records or decision support systems, and also supports electronic communication in multilingual renderings of common concepts (Coiera, 2003).

3.6.3 The Unified Medical Language System (UMLS)

The UMLS was developed by the US National Library of Medicine (NLM) to link major international terminologies into a common structure, providing a translation mechanism between them (Humphreys & Lindburg, 1989). Its long-term goal is to facilitate an understanding of medical meaning among different computer systems (Coiera, 2003). UMLS comprises three 'Knowledge Sources' (Meta thesaurus, a SPECIALIST lexicon and Semantic Network). Meta thesaurus, Semantic Network and SPECIALIST Lexicon are components that are not tied to any particular application but are flexible and can be used in a variety of settings from an EHR system to public health data and medical literature (Cohen & Shabo, 2001). Meta thesaurus has a special feature that includes vocabulary from systems such as SNOMED CT and LOINC (Logical Observations Identifiers Names and Codes) that makes it an ideal fit for the comprehensive source of the EHR system (Cohen & Shabo, 2001; Coiera, 2003).

Having a variety of standard organizations as cited above may pose a global problem for smooth communication in EHRs. HL7, CEN TC215 and ASTM E31 have each established standards that relates to EHR system but none of the standards or the coding systems can be said to have covered the entire international standards needed to share patient health information between national health systems and across the borders

(Cohen & Shabo, 2001)(Cohen & Shabo, 2001). Achieving a single standards organisation that is true to a robust EHR system will go a long way for worldwide coordination and integrations of care for its continuity (The college of family physicians of Canada, 2009).

3.7 Summary

In recent years the model of healthcare has expanded well beyond medical practice to include consumers more meaningfully, as well as providers and organisations involved in facets of service provision. EHR systems have a significant role to play in promoting and supporting this more holistic conception of health service delivery, as well as delivering key benefits in terms of improved clinical practice and patient health outcomes. However, a number of barriers to EHR system implementation exist, including security and privacy concerns and this is the focus of the next chapter.

CHAPTER 4: EHR AND SECURITY IMPLICATIONS

4.1 Introduction

Many industries center their main focus of data security program in making sure that sensitive information is available to authorised persons in order to safeguard the interests of the organisation. However, this is different in the health care sector where the focus is primarily more on the protection of the rights and interests of a patient than the interests of the organisation (Johns, 2002b). Therefore, any health care data security program should recognise the individual's right to privacy and maintain confidentiality of the physician - patient relationship (Department of Health and Human Office of the Civil Rights, 2009; Johns, 2002b; Odom-Wesley, Brown, & Meyers, 2009). EHRs represent patients who are all unique and valuable human beings and are also the center of all health care organisations, private and public. As such gaining patient trust is of paramount importance. These are all grounded in the three key ethical principles of EHRs namely 1) privacy and confidentiality, 2) security, and 3) data integrity and availability (Harmen, Flite, & Bond, 2012a).

1) Privacy and Confidentiality

Privacy is defined as the right “to be left alone” (Warren & Brandeis, 1890).

(Rognehaugh, 1999) defines privacy as “the right of individuals to keep information about themselves from being disclosed to others; the claim of individuals to be let alone, from surveillance or interference from individuals, organisations or the government.” The information shared between patient and clinician can take different forms such as laboratory results, identification data, diagnoses or treatment and progress notes that can all be stored in various media including video, paper or electronic files. All this is regarded confidential and should be protected

(Rinehart-Thompson & Harman, 2006). Privacy may be preserved if the release of patient information to others has the patients' written consent or as permitted by law (Etizioni, 1999). Consent is the agreement between a patient and the clinical staff to provide health and social care (National Health Services (NHS), 2012). For the consent to be valid a patient must:

- Not be acting under duress (acting under pressure) or ;
- Be competent and have capacity to make the particular decision; and
- Have received enough information to make it (NHS, 2012).

However, physicians may have express access as they are directly involved in the treatment of patients. Information can also be released for payments, treatment or administrative purposes without patients' authorization (Harmen et al., 2012a). Patients have legal rights to view, obtain a copy of, or amend information in their medical record (Department of Health and Human Office of the Civil Rights, 2009; New Zealand Ministry of Health, 2012).

2) Security

Security is defined as the sum of its component parts; confidentiality, integrity and availability (Solomon & Chapple, 2005).

National Institute of Standards and Technology Computer Security Division, (1995) define security as "the preservation of data confidentiality, integrity and availability, commonly referred to as (CIA) triad." The National Institute of Standards and Technology is the organization that provides guidance on securing data.

3) Integrity and availability

Integrity involves the origin, trustworthiness, completeness and correctness of information as well as the prevention of improper or unauthorised modification of information (Harmen, et al., 2012). EHR features can cause data integrity to be compromised. For example, the ability to copy and paste work from one progress notes to another (American Health Information Management Association, 2009; American Health Information Management Association, 2008) Other features such as drop-down menu may limit clinicians from recording accurately what has been identified and choices may be limited and the need to choose quickly may lead to errors. However, clinicians and vendors are making concerted effort to resolve the drop-down and the screen design menus in order to make EHRs accurate and user-friendly (American Health Information Management Association, 2009).

Availability ensures that information is readily accessible to authorized users (Harmen et al., 2012). To ensure availability, EHRs should have continuity and disaster recovery plans (regular and reliable backups) that will minimize loss (Harmen et al., 2012).

4.2 Security of Personal Health Information

“Whatever, in connection with my professional practice or not, in connection with it, I see or hear in the life of men, which ought not be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret.”

Hippocrates, 400 B.C., cited in (Mason & Laurie, 2006, p258).

Protecting patient privacy is a long-standing concern dating back to the fourth century BC (National Research Council, 1997), observed with the incorporation of the Hippocratic Oaths as the principle of medical confidentiality into physicians' professional ethics

(Anderson, 1997). The European Union Directive compelled Governments to ban the processing of health data except when the data subject had given explicit consent, and in certain circumstances (Directive 95/46 of the European Parliament and of the Council, 1995). Governments and health care unions agreed that electronic health records required the same protection as paper ones (Anderson, 1997). Protecting the privacy and confidentiality of patient information is paramount in building trust between providers and patients. This trust is of utmost importance in this age of e-health and EHRs as highlighted in the New Zealand Health Information Code 1994; the details of which are summarised in chapter five.

The problems of security of health information are the same in both paper and electronic based records. The fact that both public and private organisations have replaced the dispersed manual record keeping with centralised systems which give better access to data raises concerns relating to security of information to both providers and consumers.

Confidentiality is a privilege of the patient; therefore it is their right to know what information may be shared between members of their care team. Moreover, the number of people who are authorised to view the records has increased considerably; exacerbating patients' concerns (Gostin, 1995). Besides the number of people viewing the records, the actual content of the health record has changed as it now contains a patient's information from 'cradle to grave' (Payper et al., 2004). The IOM has made it mandatory that EHRs should include assessments of the patient's mental and emotional well-being as well as physical functioning

(Institute of Medicine, 2003). Information of such a sensitive nature is highly confidential and should be safeguarded against leaks especially to research organisations, commercial companies, pharmaceutical firms and the general public. There are different degrees of information according to the roles/interests of people accessing it. One group of users has access to health information based on a duty of a care and the other group accesses for analytical, research and financial management purposes (National Research Council, 1997a).

Direct patient care includes:

- Patients;
- Consulting physicians;
- Primary caregivers;
- Clinical laboratories;
- Hospital registrars; and
- Government disease control centres.

For this group of people the health record enhances integrated delivery of care that will ensure the best administered treatment plan for patients. The patient's clinical history will enable caregivers to fully understand patients' conditions. The speed and accuracy of reaching a diagnosis is enhanced by the ease of transferring laboratory tests to various consultants. There is also a potential to detect epidemic in a timely manner and allow enough control measures to be put in place by the disease control centre as part of the healthcare team. The ideal situation would be to limit access of EHRs to people who are directly involved in the patient care, unfortunately this is not the case as secondary users also have legitimate access to EHRs (National Research Council, 1997):

- Life/health insurance companies;
- Employers;
- Pharmacists;
- Accrediting organisations; and
- Medical researchers

This group should have access to the EHR systems on a ‘need to know’ basis. They have valid reasons for doing so. Insurers (private and government) claim the right to access personal health information in order to justify payment for medical services rendered and to detect fraud. Administrators have the right to the EHR systems in order to assess/review quality, and undertake administrative reviews and utilisation studies to manage the business aspects of health care (Myers, Frieden, Bherwani, & Henning, 2008). Medical researchers are a group that frequently come under scrutiny as they require confidential information in order to improve health practices. Medical research requires epidemiological information and this is easily obtained using EHRs; in some cases the research requires individual identifiers to be known. At other times, the question requires the investigator to link multiple sources of information such as patient health records and electronic databases in order to achieve the various outcomes (National Research Council, 1997a; Rindfleisch, 1997). In this case, there is the potential that identifiable information may get into the wrong hands under the guise of research which is why there are efforts to try and limit EHRs access from secondary users (Myers et al., 2008). Health research is also subject to ethical committee review which should review the research process to maintain the confidentiality, privacy and security of health information.

The uses that these secondary users derive from the systems are for societal, business and government benefits (Neame, 2008). However, despite signing the consent forms as a

requirement for obtaining health care, a number of people (patients and physicians alike) especially in an institutional setting, may have a vague understanding of where and often little control over their data flow (Rindfleisch, 1997). The statement below shows an example of a clinician's view on the idea of a 'need to know' basis:

“It's a commonly held view... that I as a doctor can discuss with another doctor anything about a patient because a doctor has a duty to maintain confidentiality by reason of his ethical obligations. It is just not true and it no longer holds water. Even if it helps professionals discussing individual patients with their colleagues, they must discuss only on the basis of the information the colleague needs to know” (David Bellamy, Principal Medical Officer, Department of Health, cited in Anderson, 1996, p6).

This is the point when patients' confidentiality may be breached as patients do not know what information is shared and by whom at the institutional level. After examining this 'need to know' principle in the introduction of EHRs, Anderson, (1995) commented that the integration of healthcare systems may cause the loss of traditional standards for maintaining patients' confidentiality.

Concerns about patients' confidentiality have fuelled debates about the proper balance of individual and societal interests (Myers et al, 2008). Examples of breaches of patients' confidentiality have been well-publicised as shown in the incidents below:

- The accidental attachment of an electronic file containing the names and addresses of 6,500 HIV/AIDs patients to an email in a county health department (Daugherty, 2005)
- Doctors in Australia sold their patients' medical records to a marketing firm that had connections with a pharmaceutical industry. The doctors involved claimed that it was lawful to give out information as long as there is no identifiable information about the

patient in the records. However, the argument was made that it is very easy to identify the patient by simply recognising the medical conditions in the records (Stein, 1997).

- A Merseyside sex stalker managed to hack into a GP's database in order to commit more serious crimes. He won the confidence of young women by discussing their family medical history over the telephone and then set about arranging meetings with them (R. Anderson, 1996).

Each of these examples confirms that there is a legitimate reason for patients to be concerned about confidentiality of their personal health information. Patients may become apprehensive if they know that aggregated health information is viewable not only by the administrator from their general practice's office, but also by provincial and national administrators (Anderson, 2006). The introduction of networked systems have brought about changed risk profiles from that of local, or internal system to that of global risks (Walsh, 2004).

Prior to establishment of computer networks, health information was a tangible asset. Paper records were usually stored in a specific location and the risk of a breach of security passing undetected was minimised by ensuring physical oversight of the records and of those who had access to them. Although amendments could be made to paper records, methods of detection are in existence (for example analysis of paper, hand writing, ink, etc) (Coiera, 2003). The advantages of EHRs as discussed in Chapter 2.3 are that they can easily be copied, read and amended from remote locations but this also presents a potential problem. As discussed in the above literature, centralised and distributed large volumes of patient data are likely to increase access by unauthorised persons. However, a lot of literature has documented that most threats to patient confidentiality come from inside healthcare organisations/institutions

(National Research Council, 1997b; Rindfleisch, 1997). It is important to know why a person would want to access information and the methods of breaches to confidentiality.

4.3 Security Threats to Health Data

People who attempt to acquire health information illegally for personal gains can be categorised into five distinctive groups based on intention, motive and methods (Johns, 2002a; National Research Council, 1997a).

1. Insiders who make innocent mistakes and cause accidental disclosures;
2. Insiders who abuse their record access privileges;
3. Insiders who access information for personal gain;
4. The unauthorised physical intruder; and
5. Vengeful employees and outsiders who mount attacks.

4.3.1 Insiders who make “innocent” mistakes and cause accidental disclosures

Threats from insiders who make unintentional mistakes are the most common ways that confidential information is leaked. Clinicians need to be more careful when conversing with their colleagues to ensure that no identifiable information is overheard by other people (NHS, 2002). These innocent mistakes are hard to control as they occur from human error and are unplanned. Examples include laboratory technicians who may notice test results for a friend among laboratory tests being processed, information displayed on a computer screen in a healthcare station so that passers-by can see it, employees who accidentally make a typographic error or unknowingly give confidential information. Unintentional errors are one of the major causes of a security breach. For example, a Health Net worker mailed a list of patients’ names being treated for depression to nearly 5,000 physicians due to a programme error (Win, 2005).

4.3.2 Insiders who abuse their record access privileges

This category includes insiders who abuse their access privileges to health data either on site or off-site and violate organisational policy associated with access. Some healthcare workers are inquisitive by nature and may access information that they do not have the right to. The recent New Zealand headline of a supposed privacy breach regarding sporting personality and cricketer, Jesse Ryder, is a good example. Four clinicians from Christchurch District Health Board (CDHB) supposedly accessed Ryder's medical files who appears not having legitimate reasons to do so (Torrie and King, 2013). The staff members were not involved in Mr Ryder's duty of care but they appeared to access the files out of curiosity over a sporting celebrity patient. Besides being inquisitive, health workers may access records for other reasons such as sexual interest, anger towards patient and family or over fellow employees, or friends or obstinacy (Woodward, 1995).

4.3.3 Insiders who access information for personal gain.

Healthcare care institutions such as hospitals and health boards are complex and may become easy targets from employees who seek information for the purpose of committing fraud or theft. These staff members have the authority to view information contained in the institution's systems and they are able to detect system weaknesses that they can manipulate to obtain information for personal gain. For example, in the United States there was a group of people who were caught and prosecuted for selling individual patients' information (Woodward 1996). These individuals had access to the state's medical database which they misused. It was also found in the United Kingdom that individual electronic health record could be purchased from street vendors for approximately NZ\$380 (National Research Council, 1997b). In 2003 one of Australia's leading medical record and prescribing medical suppliers of software to GPs inserted a device into its 'Medical Director' software to enable another company to upload EHRs from doctors whose practice agreed to take part in a General Research Practice Network

for a reward or payment (Pollard, 2004). A more disturbing breach of confidentiality is a case in Ireland where insiders who had access to passwords for guarded records extracted information to pass on to the IRA movement. These records were used to target politically motivated people such as police and politicians involved in law and order, British Broadcasting Corporation (BBC), (2003).

4.3.4. The unauthorised physical intruder

This type of intruders is made up of outsiders who may physically enter the organisation's property to access information or to steal computer equipment. These individuals may use social engineering as they disguise themselves as lab technicians and spend time in the organisation building in the hope of accessing information from unprotected computer terminals or to read or take paper documents, computer disks or other information. Social engineering is the art of manipulating people into divulging confidential information (Anderson, 2008).

4.3.5 Vengeful employees and outsiders who mount attacks

These intruders have no authorisation and their attack is purely technical. They break into a system from an external network and extract EHRs. This type of intrusion is a major concern as health care providers are shifting toward networking and are using information technologies in implementing EHRs. The internet can be vulnerable to a range of attacks including denial of service (DoS), viruses, data corruption or Trojan horses and these may render the systems futile (Anderson, 1999).

As can be judged from the explanations above, the five categories differ in the severity and complexity of methods that intruders use to gain access to information. There are many reasons for attacking health record systems and they are a result of different motives, resources and technicalities. Sometimes if the attacker does not get information they are looking for, they can

to a certain degree corrupt or change the information that is already stored. If the information is corrupted there is a danger of not allowing clinicians to make good decisions. Decisions using such information could be catastrophic for the patients; hence fears of such misfortunes have caused doubts in the use of EHRs for aiding decision making (Anderson, 1996; Anderson, 1999). The fears of clinicians may be justified by the fact they use record systems that utilise aggregated data.

By their nature, computers are vulnerable to problems other than those that involve intrusiveness. EHRs are systems based on software and various pieces of hardware, therefore are vulnerable to both hardware failures and software bugs. These bugs have the potential to corrupt medical records thereby diminishing the integrity of the system. When the fax, telephone or postal system fails there is evidence of this impact on the message which is meant to be delivered (Anderson, 1996); but in an EHR system the corruption may not be easily noticed. For example, altered numbers in a laboratory report or deleted large amounts of information may not be easily identified. Unlike in other sectors where errors mean financial disadvantages, errors in healthcare systems due to poor hardware construction or software design may compromise the wellbeing of both patients and caregivers.

4.3.6 Malicious software/'malware'

As can be seen from the above discussion, one of the strategic ways outsiders or 'former insiders' can resort to is to plant malicious programmes that will corrupt IT systems (Smith & Rupp, 2002). 'Malware' is a term used to refer to programmes that can cause damage to computers, and includes viruses, Trojan horses and Worms. Malware is a threat to both integrity and confidentiality of information. A virus is a piece of code that is loaded onto a computer without the owner's knowledge, it can replicate itself and harm the system it infects (Erbschloe, 2005). It is dangerous because it can quickly use all the available memory and

bring the system to a halt (Aycock, 2006). Trojans are malware hidden within other files that may appear safe, designed to supply hackers/crackers with access to system files. Trojan horses can afford crackers the ability to change file settings, steal passwords or files and can spy on user activities on other computers on the network (Aycock, 2006; Erbschloe, 2005). For example, in 2003 Simon Valler, a hacker created Gokar virus and it became one of the most widespread virus of the time. It clogged networks and crippled hundreds of thousands of computers in forty-six countries. Gokar was in the form of email attachments and when the email was opened it sent itself to addresses in the user's email directory. (BBC, 2003).

4.3.7 Hackers/ Crackers

Hackers/ crackers are a huge threat to EHRs. A hacker is a person who breaks into a system for which they have no authorisation or legal access. A cracker is someone who breaks into a system using access tactics such as password cracking, exploiting known security weaknesses, network spoofing or social engineering (Lehtinen, et al, 2006). The act of intrusion into EHRs is a major concern as the integrity of the information and the system may be compromised. To emphasize the above point, the Office of the National Coordinator for Health Information Technology refers to the EHR as “not just a collection of data that you are guarding – it's a life”(Harmen et al., 2012b). Evidence has shown that breaches of security have negative impacts on consumer health care and that many health care providers may resist the coordination of medical databases despite the potential benefits (Goldberg, 2000). As many institutions and hospitals have implemented EHR systems, incidences of security breach by hackers are increasing. In 2000, a hacker penetrated the computer system of the University of Michigan Medical Centre and stole approximately 5000 medical records belonging to cardiology and rehabilitation patients (Win, 2005). In another incident, an ethics hacker broke into systems of two different hospitals, one in Holland and another in the United States (Lemos, 2000) to illustrate some vulnerability in the systems. Although no reports of damage

were made, the incidents have demonstrated that rules and regulations surrounding the storing of health information need to be more robust against such challenges (Chhanabhai & Holt, 2007).

4.4 Information Security Measures

Improved information technology benefits healthcare organisations in many areas of public health such as surveillance, research, education and health care delivery (Myers et al., 2008).

The primary objective of health organisations for switching over to technology is to supply information when and where it is needed and EHR system has the potential to ensure the smooth delivery of the information flow. The above threats have indicated that there are eminent risks in regards to the flow of health information. Taking security measures will go a long way in preventing systems and information from being damaged, altered and stolen; in detecting when information has been damaged, altered, or stolen and by whom. Security measures will also help in ensuring that information recovery measures are put in place. A security system should provide five key functions:

- 1) Authentication;
- 2) Authorisation;
- 3) Access control;
- 4) Accountability; and
- 5) Availability. (National Research Council, 1997).

4.4.1 Authentication:

Authentication is the process of determining whether someone or something is, in fact, what or who they declare to be in a computing environment. Generally, user to computer authentication is often based on one or more of the following:

- Something the user owns such as a lock key, smart card or some type of token;

- Something the user knows such as a unique identifier or password;
- Something related to the user such as their signatures, fingerprints; and
- Something that indicates where the user is located such as phone number in a call-back scheme or a network address (National Research Council, 1997).

As EHRs become integrated between healthcare organisations, access mechanisms become an important factor for the system. The most commonly used authentication mechanisms in EHRs are an “identifier” with a mixture of a “password” (Allaert et al., 2004). However, authentication is only effective if the users do not share their key with others. The system is effective but has its own drawbacks. For example, people may choose passwords that are easy to remember, and thus easy to break. By their nature, people have a tendency to write the password down and leave it for other people to utilise it (Anderson, 1999).

4.4.2 Authorisation:

The physical security of an EHR system can be augmented by the use of a process of access only to authorised users through the implementation of firewalls and encryption technologies. EHRs contain sensitive information such as mental health history, obstetric history and HIV status. If this sensitive information is easily accessible in the automated patient health records then there will be a clear breach of patients’ privacy. Therefore, healthcare organisations and stakeholders have the mandate to maintain confidentiality of data and systems including monitoring for any access by unauthorised users (Win, 2005). It has been documented and stressed that protection of patient records is achieved by implementing security policies to control access, by providing authorisation processes before releasing the health data and by providing additional security to more sensitive data (Chilton et al., 1999). The use of these special technologies has increased user accessibility and privacy protection. Hence the uses of these accesses control models.

4.4.4 Availability:

This is a process of protecting systems against loss of data by performing regular systems backups. As hardware and software may never be completely reliable, long-term aggregated information should be copied onto archival storage where copies are kept at remote sites to protect the data in case of disaster (Wiederhold & Rindfleisch, 2001). When using EHRs there is need to protect data for both the short and long term. For short term protection, data can be written on a duplicate storage device. Acute health care service systems should always be ready to operate even during environmental disasters. Therefore, it is always important to provide alternative power systems for continuous operation of EHRs. It is also essential to maintain the integrity of EHR systems information software to ensure availability. Backups will allow administrators to roll back to the earlier version of EHRs' database contents and software should there be any software failures (Shortliffe, Perrault, Weiderhold, & Fagan, 2001).

4.5 Audit Trails/Accountability

Audit trails are records of events associated with a system, an application or user activities that are critical to successful audits and intrusion detection. The importance of preservation of patient privacy has always been stressed (Anderson, 1997; Gostin, 1995; National Research Council, 1997; Odom-Wesley et al., 2009; Rinehart-Thompson & Harman, 2005). Therefore, audit trails should contain detailed information to establish which events occurred and what or who was responsible for the occurrence of the executed events. The level chosen should then depend on the ability to use the data and the level of security needed

(Steinauer, Katzke, & Radack, 1999). The more detail that is recorded the more sensitive the audit trail becomes. For example, when the record audits of logins contain the data entered by users, the audit trail will contain clear-text user IDs and passwords (Steinauer et al., 1999).

Audit trails can help the administrators to ensure that the system or resources are well maintained and provide insights into the patterns of usage that are helpful in system upgrades.

Audit trails could give insights into alleviating issues such as systems outage. The date and time in an audit trail could determine whether a logged-in user is masquerading as a real person or the actual person specified. For example, in such cases when the time of day or activities performed were out of the ordinary for a user, it would be appropriate to investigate the activity. System administrators should make sure to choose audit data and carefully detailed analysis capability (Steinauer et al., 1999). This fact will be helpful where EHR systems are in use because of the sensitive nature of healthcare information that EHRs contain.

4.6 Access Control Models:

Access control processes help to ensure integrity, non-repudiation and confidentiality of health information. There are different types of access control models that can be selected to use for the privacy of sensitive healthcare information. Access control is important in preserving the confidentiality and integrity of information. Confidentiality implies that only authorized users should read information, while integrity requires that only authorised users should modify information in an authorised manner. Access control does play an indirect role in preserving availability. For example, an attacker who has unauthorised access to a system could use a small problem to bring the IT system down. Access control models are classified into different categories but this study focuses on the following three:

- Discretionary access control (DAC) which is based on the principle of granting access control privileges that are left to the discretion of the individual user. Therefore, in this case it will be the individual patient who will have to decide who can access the record. However, the situation is different in:
- Mandatory Access Control (MAC) which is based on the sensitivity of the information contained in the objects and the formal authorisation of information of such a sensitive nature (Khan & Sakamura, 2012). Therefore in MAC the decisions related to the access

control policy are executed by the administrator and not by the individual owner of an object and also the owner cannot change access rights (Khan & Sakamura, 2012). This type of access model can increase security as it is based on the central authority and not solely on the patient who may be vulnerable in such situations of emergency cases or mental health issues.

- Role-based Access Control (RBAC) operates on the basis of access decisions related to the roles that the individual users hold as part of the organisation

(Shandhu & Chen, 1998). The process of defining roles is based on thorough analysis of how the organisation operates and it includes input from a variety of users in that organisation. The permissions are then defined for roles, instead of for the user, but once the user takes up the role, the user is assigned role privileges (Khan & Sakamura, 2012). The RBAC makes the administrator's job easy as it can directly support an organisation's security policy. According to Sandhu & Chen (1998) if a user moves to a new function within the organisation, there is no need to revoke the authorisations that the user had and grant the authorisation for the new function. It is also regarded as a neutral policy as it has the ability to support a wide range of security policies, especially, by appropriately configuring a role system where one can support different policies that include mandatory and discretionary policies (Shandhu & Chen, 1998).

4.7 Anti-virus software:

With healthcare information systems becoming an integral part of all aspects of health care, healthcare organisations have to ensure that their networks are able to control threats from virus attacks. Installing anti-virus software as part of EHR systems is essential to ensure integrity and confidentiality of the stored data.

Anti-virus software is one of the most widely used security mechanisms today, designed to block viruses. As incidents involving viruses are increasingly frequent occurrences, it is important to an antivirus product that is able to detect, eliminate and quarantine malware before it can deliver its payload on the system. The action that the code will have on the system is called payload. The types of payloads include Denial of Service (DoS), data corruption or deletion, information theft, allowance of backdoor access and systems shutdown

(Schoudis, 2011). Each of these payloads will infect EHRs with viruses and jeopardise the sharing of health information. Antivirus software needs to be updated constantly in order to keep abreast with continual virus iterations or ‘mutations’. With live updates the process is made easier and can be run frequently without much effort from any member of the healthcare team.

There are three distinct ways in which antivirus software works: signature matching, heuristics scanning, and integrity verification/checking.

- Integrity checking is a process that based on checksum algorithms. A checksum is a calculated value used to test data integrity. In a checksum, all the bytes of data are calculated by sequentially combining them with a series of arithmetic or logic operations (NIIT, 2004). Antivirus programs that utilise this feature achieve their goal by recording the integrity of the information about important files on the system. The programme makes a copy when the machine is in the pristine state and records its checksum to capture the integrity of the record. After any suspicious activity the program compares the checksum of the file before and after the attack. If the file has changed due to malicious activity, the file will no longer match the recorded integrity information. This is an intensive and complex procedure process therefore; many antivirus programs do not make use of this feature. However, those that utilise it will

have the system user reverted back to original state of the file before it was infected by the virus. Integrity checking is ideal for an EHR system as the software ensures that any medical information that has been modified by malicious code will be detected and brought to the attention of the administrator. The administrator will then ensure that the information being accessed is correct even after virus attack

(Lehtinen, Russell & Gangemi Sr., 2006).

- **Signature Matching:** Many antivirus programs currently use this method. Each piece of malicious code has a unique pattern called signature. In this method the antivirus software searches the system for a pattern that represents malicious code. In order to prevent false alarms, antivirus software using this technique will also check the code of suspected file either against the virus code or a checksum of it (Skaudis, 2011). This technique is often very secure and is mostly used in antivirus programs. However, its disadvantage is that it needs the virus signature to be loaded into its signature files. If not, it is not able to detect the virus.
- **Heuristic Scanning** is a generic method of virus detection. It is similar to the signature-based detection method but heuristics work by looking for specific instructions or commands that are not normally found within a given application. When the heuristics scanner examines a file, it will assign a value to each virus-like feature it encounters. When the file's aggregated weight exceeds a certain threshold, then the scanner will consider it malicious code. If the scanner developer sets the threshold too low, the user could be overwhelmed with false alarms. Alternatively, if the threshold is too high or if virus-like features are not properly identified, then the detector will miss too many viruses. Otherwise, the user's sensitivity is limited unless the sensitivity is set right (NIIT, 2004). Heuristics have a number of problems such as false positives, slower

scanning times and like signature scanning, and may miss new characteristics that have not been updated in the heuristics rules (Harrison, 2004).

The virus detection techniques discussed above show that there is no one perfect virus detection method. The best way is to utilise all these techniques together. It is advisable for the administrators of EHRs to ensure that antivirus software is updated regularly and that users of the system take note of any suspicious files or applications. Using antivirus software does not guarantee a hundred percent protection of all users but healthcare records will be safe from the most unusual viruses if proper care and attention is applied.

4.8 Encryption:

Security and privacy are always complementary as far as patient health information is concerned (Shorinegan et al., 2010). In the EHR system patient confidentiality is an obligation shouldered mostly by clinicians who will make sure that information about a patient is not disclosed to third parties without the patients' consent. This is where encryption comes in relation to EHRs. Encryption is a method of protecting sensitive information and it goes back to 4,000 years (Lehtinen et al., 2006). Encryption works well in terms of containing information in a secretive manner, and therefore, is able to preserve confidentiality (Shorinegan, Dube, & Mtenzi, 2010). Even if an outsider is able to steal a computer or access an encrypted file in an EHR, he/she will find it very difficult to determine the meaning of the information (Lehtinen et al., 2006). In addition to preserving confidentiality of information, encryption can protect information from fraudulent uses or alteration. The process can detect even a minute change in the information of the EHR system. This process of detecting even a minute malicious act in the information is important for preserving the integrity of EHRs. Integrity is one way that the EHR users can ensure that their communication has not been tampered with or affected by viruses or perpetrators. Encryption will ensure that the healthcare

information shared by a large number of individuals is authentic, and that it comes from who that individual says he/she is. The use of a digital signature is an important authentication technique and is difficult to forge (Lehtinen et al., 2006).

However, encryption has its own disadvantages especially in the use of EHRs. Orfanidis et al., 2007 carried out a simulation-based performance analysis of a national EHR system and found that internet link technologies cause long delays during EPR (electronic patient record) exchange and half of the national EHRs response time came from encryption/decryption process which is necessary for the data security. There can be queuing that builds up during the exchange of information in the EHRs between different service points (Orfanidis et al., 2007). These delays come from LAN (Local area network) and Internet technologies, EPR encryption/decryption, the HL7 message parsing and the databases (Orfanidis et al., 2007). Cryptographic systems are identified through two general categories namely “private key” and “public key” systems.

4.8.1 Private Key (symmetric) encryption.

Private Key encryption involves the use of a shared key to decrypt and encrypt data (see Figure 4.1). A separate key is needed for each pair of EHR users who are exchanging messages and this should keep the sides of encryption transaction secret. The symmetric key systems have very long and strong keys but since they are based on a single key, the encryption process can be cracked easily (Solomon & Chapple, 2005).

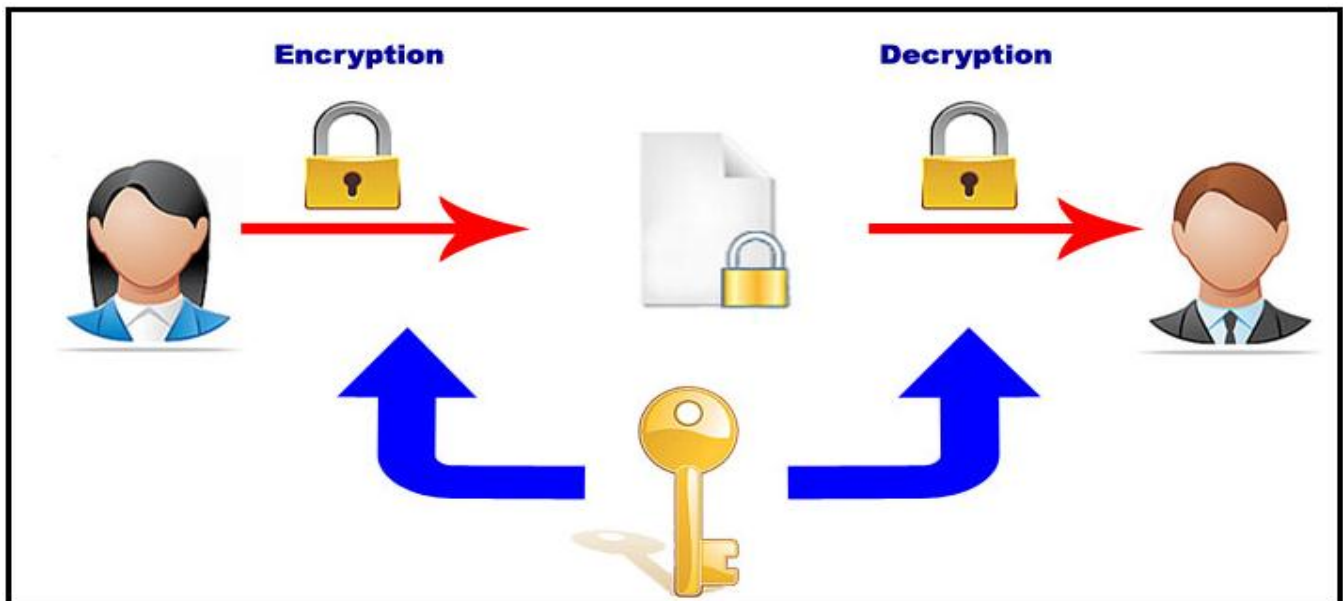


Figure 4.1. Example of private key (Kryptotel, 2010)

<http://kryptophone.kryptotel.net/faq/encryption/index.html>

4.8.2 Public key/ asymmetric encryption

A public key is sometimes called asymmetric or two key systems. It uses a public and a private key. Each user within a group of users has both a public and a private key. The algorithms that generate the key/password do not allow obtaining one key from another (NIIT, 2004). The private key is shared and is the only key that will decipher the message (Figure 4.2). The most commonly used asymmetric key algorithms are RSA (Named after inventors: Rivest, Shamir & Adleman). This is a much more secure method than private key despite it being complicated (Solomon & Chapple, 2005).

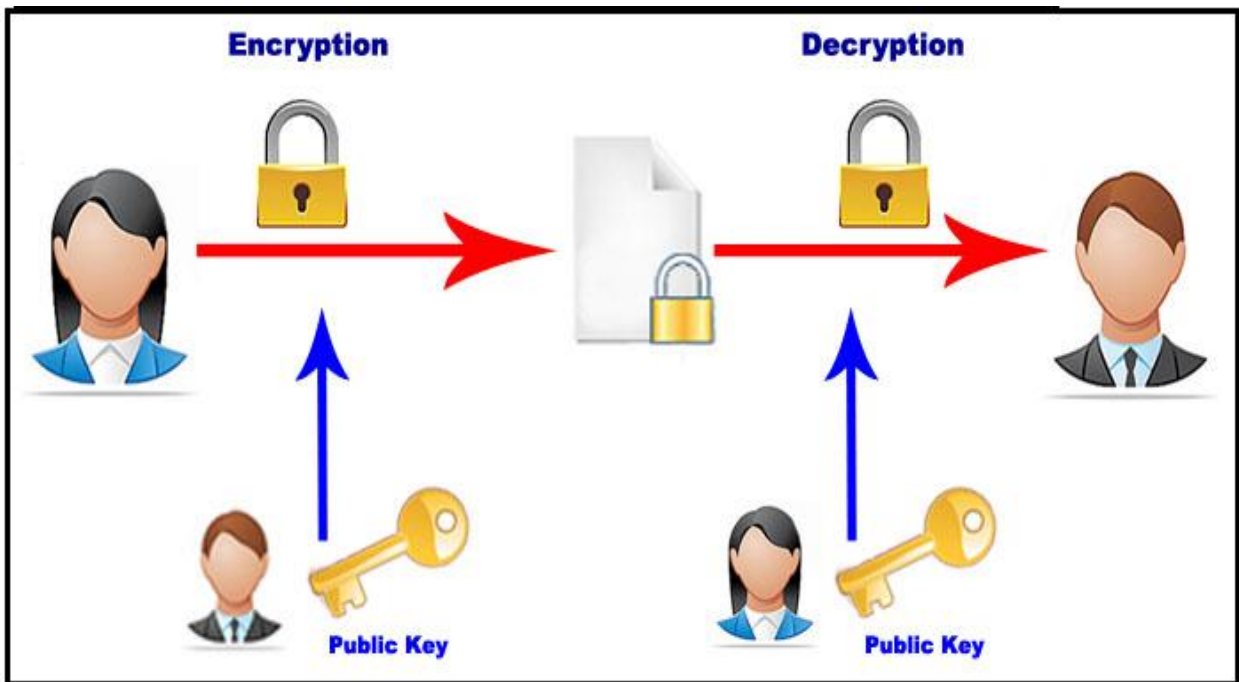


Figure 4.2. Example of public key (Kryptotel, 2010).
<http://kryptophone.kryptotel.net/faq/encryption/index.html>

Both types of encryption can provide levels of security to health information and can make cracking and accessing information much harder. However, symmetric keys are not user friendly in large environments and are not practical for use when more than a few users are involved (Solomon & Chapple, 2004). The differences in use between the symmetric and asymmetric keys are illustrated below (Table 4.1).

Table 4.1. Comparison of private and public keys (Solomon & Chapple, 2005).

Private key (symmetric)	Public key (asymmetric)
Provides confidentiality among all participants who share the same secret key	Provides confidentiality between individual user of the key
Provides integrity against modification by individuals who do not possess the secret key	Provides integrity against modification by anyone other than the sender of the message
Provides for authentication between two individuals when they are the only ones who possess the key	Provides for authentication of any individual user of the public key
Do not provide for non-repudiation	Provides for non-repudiation
Requires shorter keys for than asymmetric algorithms to achieve the same level of security	Requires longer than symmetric algorithms keys to acquire the same level of security
Functions faster than asymmetric key	Functions slower than symmetric keys
Are not easily scalable	Scale well with a large number of users
Makes the exchange of cryptographic keys hard (often requires offline exchange)	Allows for the exchange of public keys over otherwise insecure transmission

4.9 Firewalls

Firewalls serve as cornerstones of network security in healthcare organisations. They serve as the first line of defence against malicious attacks and unauthorised traffic that may disrupt access to information in EHRs (Liu, 2012). A firewall is placed at the point of entry between a private network and the outside internet so that incoming and outgoing health data have to pass through it. When examining the incoming and outgoing data the firewall will decide whether to discard or accept it. This process is specified by a sequence of rules which is called the policy (configuration of the firewall) Figure 4.3 below illustrates the firewall and the rules (configuration), Figures 4.4; 4.5 and 4.6.

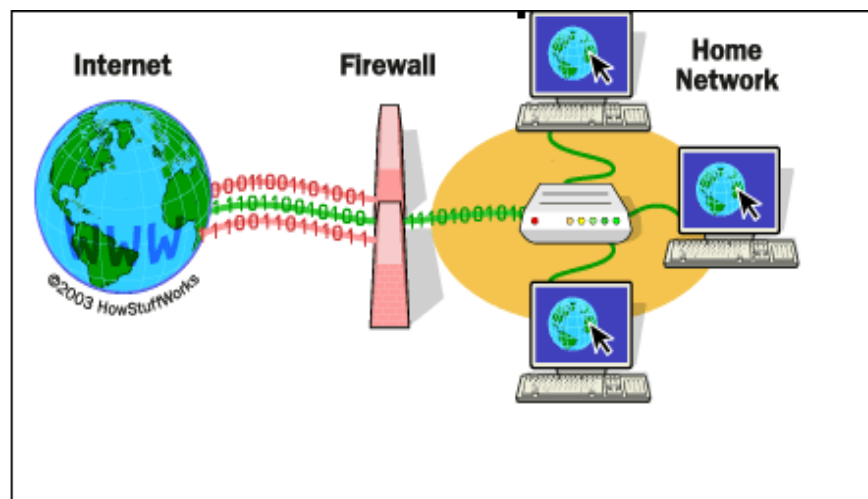


Figure 4.3. A Basic Firewall Diagram and its mechanisms

(Source: firewall.gif, 2010) URL below.

<https://www.google.co.nz/search?q=firewall+.gif&rls=com.microsoft:en-nz:IE-SearchBox&tbm=isch&tbo=u&source=univ&sa=X&ei=FblTUtjhO62Tigf0woDICA&ved=0C DYQsAQ&biw=1184&bih=518&dpr=1>

There are three main types of rules/configuration that could be used in EHR systems to monitor for malicious activity. These are called inside and outside IPS (Intrusion Prevention systems) and DMZ (Demilitarized Zone). The figures below illustrate the configuration.

- Inside IPS: The inside configuration protects both internal and DMZ segments. It can only inspect traffic that is allowed into the network, therefore, is able to minimize false positives. It can also differentiate traffic to and from DMZ and internal segments. However, the fact that it can protect both internal and DMZ segment, means that this configuration will require two IPS in order to be able to protect both segments (Sanbower, 2010).

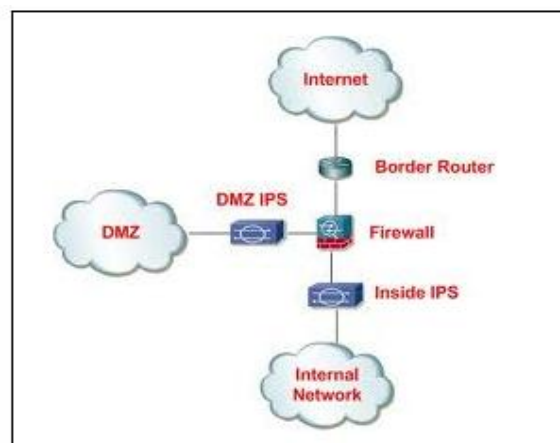


Figure 4.4 Inside configuration of a firewall (Source: Caysec, 2010), URL below
<http://www.caysec.com/2010/09/intrusion-prevention-best-practice-ips.html>

- Outside IPS: This configuration places the firewall outside the internet firewall. It will still allow the external network to be attacked and will create false positives. This type

of configuration may not be suitable for EHRs as it allows the external network to be attacked (Sanbower, 2010).

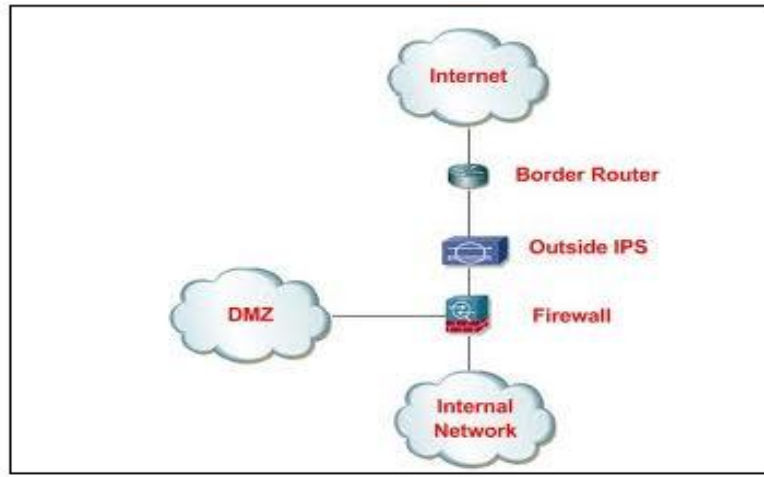


Figure 4.5. Outside configuration of a firewall (Source: Caysec, 2010), URL below:
<http://www.caysec.com/2010/09/intrusion-prevention-best-practice-ips.html>

- DMZ: These are more popular than the outside and inside configurations as they use a unified threat management (UTM). They are able to detect and respond to threats before these threats cause significant damage. As EHRs need to be carefully guarded this method could be the ideal one for health care organisations so that they can maintain an overview of what is going on and combat malicious threats (Sanbower, 2010).

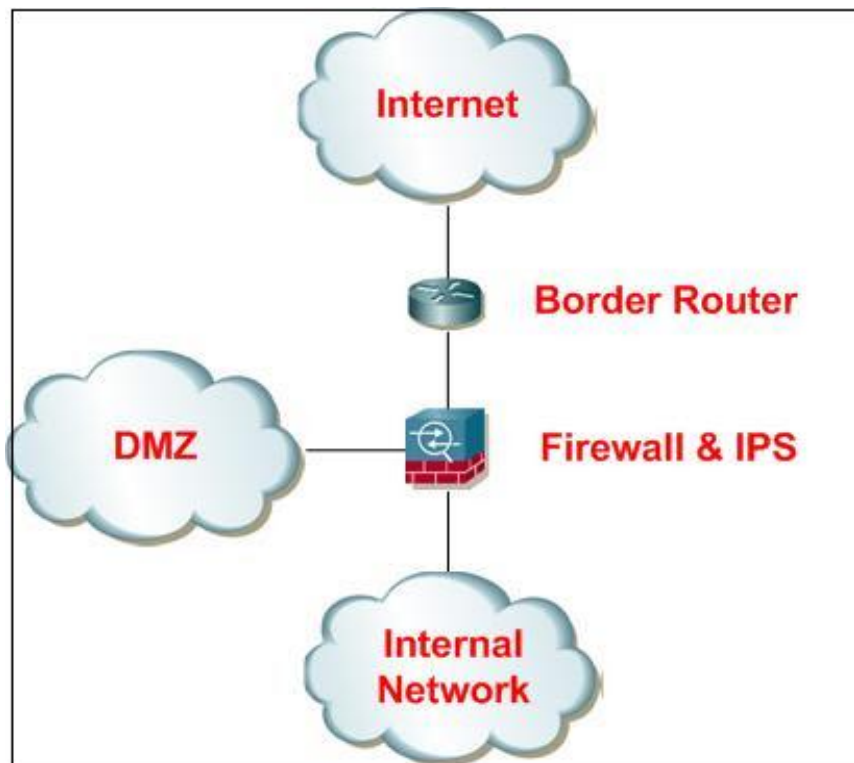


Figure 4.6. DMZ configuration of a firewall (Source: Caysec, 2010), URL below <http://www.caysec.com/2010/09/intrusion-prevention-best-practice-ips.html>

There are different mechanisms that firewalls use to restrict traffic. In order to provide more reliable protection packet filtering, circuit-level gateways and application- level gateways are also used in conjunction with other firewall mechanisms:

- Packet Filter

Packet filters are a part of several different kinds of firewalls that control network traffic on a packet by packet basis. Their main duty is to filter traffic from a remote IP host, so a router is required to connect the internal network to the internet. The router is known as a screening router, which screens packets entering and leaving the network (NIIT, 2004).

- Circuit-level gateways

This is a proxy server that will statistically define which traffic should be allowed. Circuit proxies usually forward packets that contain a port number, provided that number is permitted

by set rules. This gateway functions at the network level of an OSI (Open System Interconnection) model. The major advantage of proxy server is its ability to supply Network Address Translation (NAT), which can hide the user's IP address from the internet, effectively protecting the rest of the internal information from the Internet (Lehtinen et al., 2006).

- Application-level gateway

An application-level gateway is another type of proxy server that operates at the TCP/IP application level. A packet will be forwarded only when a connection is established using a known protocol. Application-level gateways are popular for analysing entire messages rather than individual packets of data when data are being sent or received (Lehtinen et al., 2006).

4.10 Summary

This chapter has demonstrated that attacks to health information in EHRs come from all directions given that networks are borderless. The threats range from human unintentional to human deliberate and malicious and technological attacks. Therefore, organisations will require strong prevention intrusion mechanisms to be put in place in order to prevent these evolving security threats. With the use of security mechanisms that were highlighted in this chapter, it is hoped that there should be a decrease in the fears that consumers have regarding the security, privacy and confidentiality of EHRs.

CHAPTER 5: EHRs IN NEW ZEALAND

5.1 Introduction

New Zealand was ahead of time in visualising the importance of strategic information planning in health. The formation of the Information Health Strategy in 1991 and then the updated strategic framework of “Health Information Strategy for the year 2000” in 1996 followed by the “Working to Add Value of E-information (WAVE) report are all indications of the early and clear vision of the importance of technology use in the health sector (MOH, WAVE Report, 2001).

The authors of the WAVE report surveyed GPs in primary care regarding their use of electronic health records and discovered that there was sufficient infrastructure to support the implementation of EHRs. The results revealed that:

- 57% of GPs were using Patient Management Systems (PMS) to record some clinical data and stored prescriptions;
- 71% indicated that they would be using PMS within the following years.

According to the results of the above study, it appears there is an emphasis on developing electronic capability to assist in sharing patient records. However, a brief background on the use of electronic health systems will show how New Zealand becomes to be a global leader in the EHRs field.

5.2 Background

General practitioners in New Zealand began using computers in their practices in the 1980s. By 1993, about thirty percent of GPs had a computer system and ten percent of them began storing clinical information on their computers (Protti et al, 2008; Protti & Graham, 2003). In 1992, (MoH) introduced several key initiatives including a National Health identifier (NHI) database-structure; structures focused on health information privacy and collaboration with private sector organisations to develop and deliver information services to the health sector. The increasing use of technology in the healthcare sector increases the quality of healthcare services and so New Zealand consumers were able to benefit early on from these evolving technologies (Roukema et al., 2006).

New Zealand is regarded as a global leader in the field of electronic health record (Protti et al., 2008). The information projects that were encouraged by (MoH) in the 1990s are the chief contributors to the success story of EHRs in New Zealand as Protti (quoted in HealthLink Network, 2012) notes: “New Zealand’s status as a global leader in integrated healthcare IT has been confirmed in a landmark ten-country study that named New Zealand as having the second most integrated advanced country in this field after Denmark; What matters is that a unifying organisation is responsible, as well as some kind of Government impetus; New Zealand operates its healthcare IT project through a wholly private company” (HealthLink Limited).

Following the WAVE report, Didham et al (2004) conducted a study on IT systems in general practice in New Zealand and found that almost 99 percent of GPs were using a Patient Management Systems (PMS) and 99.8 percent had at least one computer in their practice. This shows a pattern of further IT adoption and implementation in New Zealand healthcare sector as new technologies emerge.

The National Health Index Number (NHI) is a unique identifier assigned to every person who uses health and disability support services in New Zealand (MoH, 2012) and was first developed and in use in 1992. Its coverage is estimated to be 98 percent of the population.

Health professionals use the NHI number for administrative and clinical purposes. A NHI number identifies a person and ensures that their information is correctly associated with their records. This decreases the likelihood of making decisions based on incorrect information, particularly important as patients are more mobile and the use of EHRs in health care is increasingly emphasised. The NHI number also allows for a person's health information collected in independent systems (for example, laboratory, pharmacy and discharge/admission/transfer) to be brought together (MoH, 2013).

The number is also associated with the Medical Warnings System (MWS). This system issues a warning to health professionals if there are any known risk factors that might be important when making clinical decisions about an individual (MoH, 2012).

The national Health Information Standards Organization (HISO) was established in New Zealand in 2003. Its aim is to support the development of management and technology standards for the health sector (Kerr, 2004). The HISO ensures that applicable standards such as HL7 are identified for the use of the health sector. As “a set of rules, conditions or needs related definitions of terms” (Hovenga et al., 1996) standards enable the sharing of information between departments, healthcare organizations and healthcare workers. The development of standards nationally and internationally provides proof for data access and storage (Ministry of Health 2012). Thus, the use of standards is important as the health sector moves towards integrated healthcare.

EHR architecture is integral to the sharing of consumers' health records among care providers (Gunter & Terry, 2005). New Zealand is implementing architecture that permits sharing either on a need-to-know basis or that limits data access to providers within the "circle of care" (Terry & Francis, 2007). Other countries are also implementing EHRs architecture suitable to the needs of their own health environments. The list of countries involved in the implementation process is long, but for the purpose of this study EHR architectures of the United States of America, Australia and Canada will be examined.

5.3 EHR MODELS

5.3.1 New Zealand EHR Model

New Zealand as a country has embarked on a wide-ranging Health Information Strategy that includes interoperable EHRs event summaries distributed at local, regional and national levels. The National Policy and standards, financial incentives, active encouragement of private sector involvement; a health system Integrator; a unique patient identifier; and a robust privacy laws have all combined in New Zealand to create an environment that supports EHRs systems innovation (Protti & Bowden, 2010). Many countries are hoping to have interoperable national EHRs; however, New Zealand has decided not to have a national EHR database (New Zealand Ministry of Health, 2005). Figure 5.1 below shows the model of EHR system adopted in the New Zealand healthcare environment:

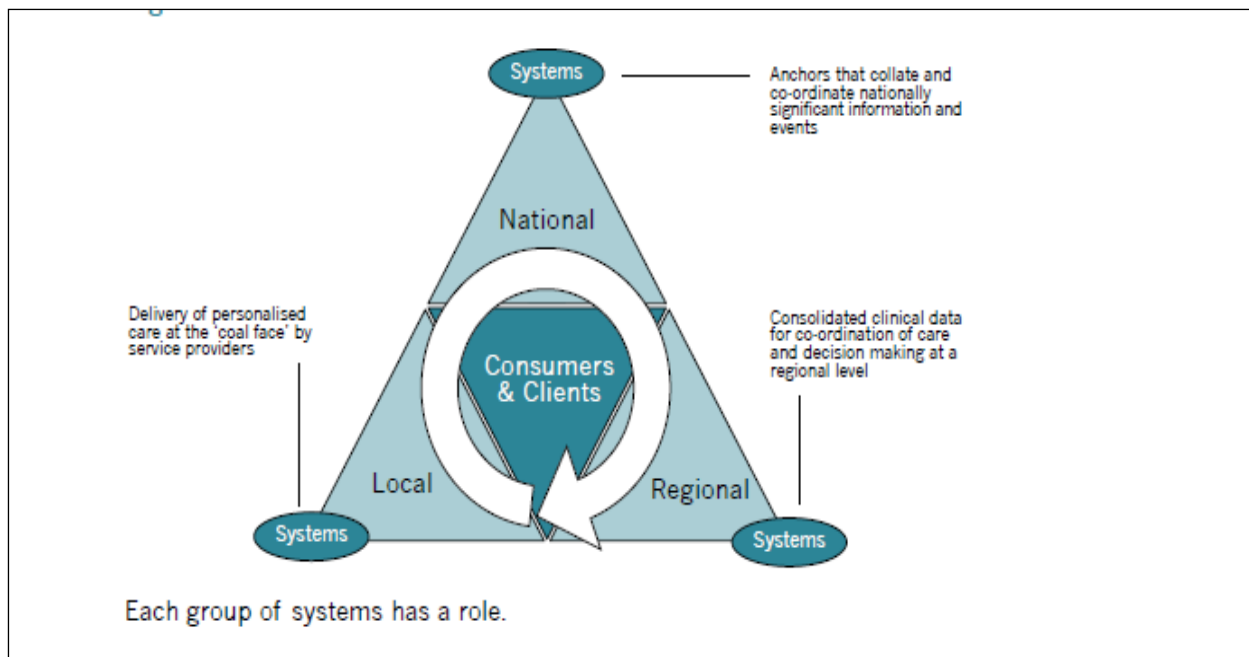


Figure 5.1 New Zealand EHRs Model (Source: Health Information Strategy – New Zealand (2005).

- **Local systems** are the first point of contact between consumers and providers therefore; they supply a rich source of information to service providers delivering health care to consumers and disability services to clients. These service providers include Primary Health Organisations (PHOs), dentists, pharmacists, general practitioners (GPs), hospitals, community services providers and residential care facilities.
- **Regional systems** consist of District Health Boards (DHB), PHOs and shared support agencies. These systems provide the health care sector with event summaries that support the sharing of data. Examples of event summaries include hospital discharge summaries and disease management applications.

- **National systems** include the National Health Index (NHI), the Health Practitioner Index (HPI) and clinical safeguards such as the Medical Warning Systems (MWS). These systems are managed by national agencies such as District Health Boards New Zealand (DHBNZ), Accident Compensation Corporation (ACC) and the New Zealand Ministry of Health (Health Information Strategy for New Zealand, 2005).

5.3.2 Examples of EHRs models in New Zealand.

New Zealand already has a number of functioning regional EHRs implemented in some parts of the country:

- The West Coast District Health Board has successfully set up a Primary Information Systems Management (PrISM). PrISM is an EHR system that is regionally incorporated and is available throughout the district. It integrates multiple EHRs such as digital radiology, laboratory test results and patient administration systems (Greenwood, 2007). It was established in 2005.
- Another regional EHRs success story is the TesSafe project implemented between the three Auckland DHBs of Waitemata, Auckland and Counties Manukau. TestSafe aims at enhancing the sharing of patients' information among hospital care providers and the community (Naylor, 2010). Health care professionals are able to access diagnostic results from both ADHB facilities and community laboratory through these regional EHRs.

5.4 EHRs models in other countries.

5.4.1 Australia HealthConnect EHRs model:

HealthConnect is Australia's national health information network. Australia supports a model that extracts a summary record of patient data collected from a local record. The extracted data is then aggregated into a centralized HealthConnect record that will enable coordination of care

among authorized and participating providers (Australian Government Department of Health and Ageing, 2004). This model allows patients and their providers to choose the information to be extracted from the existing health record and forwarded to the HealthConnect record. It also allows patients to choose those who may access their health records (Gunter & Terry, 2005). Thus; HealthConnect does not focus on a comprehensive longitudinal record, but depends on a “push” model that sends data to a centralized record (Australian Department of Health and ageing, 2004, p 30-31).

5.4.2 Canada Infoway EHRs model:

Canada Infoway is a non-profit partnership of federal, provincial and territorial governments that coordinates the development of pan-Canadian interoperable EHR systems. At present, Infoway develops technical interoperable EHRs event summaries that can be distributed at local, regional and national levels (Canada Health Infoway, 2005).

5.4.3 United States EHRs model:

The United States of America have implemented two major alternatives to a fully interoperable EHRs architecture. These are Continuity of Care (CCR) and Personal EHRs (PEHRs). CCR was developed by the Health Information Management and Systems Society in collaboration with other professional bodies (Terry & Francis, 2007). Its aim is to extract data from existing organisations’ EMRs systems and export these to a common text export format (XML, 2006). This will allow portability of data and enable transmission to a patient’s next provider.

A PEHR is a personal database collected and maintained by the patient who then decides to what extent it is shared with the providers (Gunter & Terry, 2005; Landro, 2005) PEHRs are supplied free of charge by employers or healthcare providers on a subscription basis. The PEHRs may be in the form of web-based database or installed on the consumer’s own computer (Terry & Francis, 2007).

5.5 Regulations

An effective relationship between health provider and consumer is based on privacy, confidentiality and trust; three attributes which, in this context, have origins in the Hippocratic period (Mason & Laurie, 2006). The perception of privacy is integral; if patients believe their privacy is protected, their trust in their healthcare providers is increased. However, if they feel their health information will not be kept confidential, then they are less likely to share any sensitive data that may be necessary to guide their care (Beard, 2004; Hunter et al., 2009; Thornton & Goodwin, 2005). Reports of unethical acts concerning sensitive health information have influenced federal governments to put in place regulations for the security and sharing of medical information (Thornton & Goodwin, 2005). In New Zealand the Health Information Privacy Act 1994 governs the collection, use and disclosure of health information. The HIPAA Privacy Rule enforces the protection of private medical information in all fifty states of the United States of America (Terry & Francis, 2007).

5.6 Health Information Privacy Code 1994

During the course of their work, healthcare providers receive and hold large amounts of personal health information about consumers and their families. It is important that health care providers and organizations respect the personal and sensitive nature of such information (Privacy Commissioner, 2008a) New Zealand has a number of regulations and standards designed to protect the privacy of personal health information (Privacy Commissioner, 2008a).

The Health Information Privacy Code has been in existence in New Zealand since 1993. The privacy code is a special amendment to the New Zealand Privacy Act of 1993. The Code is well understood throughout the health sector and as a result there is a high level of awareness of the importance of individual consumer's privacy (Protti & Bowden, 2010). The Code mandates obtaining individual's agreement (whether implicitly or implied) for the sharing and use of

personal identifiable health information. A Privacy Commissioner acts as a complaints authority to enforce the regulations and the overall performance in health care

(Protti & Bowden, 2010).

The Privacy Code requires individuals to have some measure of control over personal information held by an “agency;” “a person or body of persons [whether large or small organizations] in the public or private sector” (Privacy Commissioner, 2013). Twelve information principles that deal with holding, collection, use and disclosure of personal information are established. The Code also deals with the use of identifiers for every individual that an agency deals with.

Privacy Commissioner stated the need for regulation of health information systems and projects in accordance with privacy legislation; he recommended comprehensive privacy impact assessments in order to ensure compliance with the code.

The success of the Privacy Code led the government to put in place a more health information-centric Act, the Health Information Privacy Act 1994 (Dalziel & Johnson, 2004). This code of practice provides specific rules that apply to the collection, storage and disclosure of health information by the agencies rather than to personal privacy. A summary of the rules are found in appendix “C”. Rules relevant to EHRs include: rule 3 – collection of health information from the individual; rule 5 – storage and security of health information; rule 10 – purpose and use of health information; and rule 11 – limits and exceptions on disclosure of health information (Privacy Commissioner, 2008).

5.7 Health Insurance Portability and Accountability Act (HIPAA)

The United States Department of Health and Human Services (DHHS) proposed the HIPAA Security Rule in 1996. The Health Insurance Portability and Accountability Act 1996 (HIPAA)

offered some general guidelines to enforce the protection of private medical information. One such guideline stated that patients should be able to view and obtain copies of their records and; request amendments to confirm they have the right of accessing their medical records in order; to understand and monitor their health status and the process of diagnosis and therapy(Fowles et al., 2004; HIPAA 2005; Office for Civil Rights, 2003; Sadan, 2001).

HIPAA aims at protecting the American citizens who may be subjected to discrimination and those who suffer from pre-existing medical conditions (Office of the Civil Rights, 2003). The scope of HIPAA evolved and after certain changes it became law on April, 2001 (Office for Civil Rights, 2003). HIPAA's influence on IT includes requiring the assurance of integrity, confidentiality and availability of all protected personal health information. It ensures that health information is protected against any threats and vulnerabilities and from unauthorized use or disclosure (Apani Networks, 2005; Morgan-Lynch, 2006). HIPAA also ensures that all staff members comply with safeguards regulations regarding patient information security and privacy. For example, maintaining an audit trail consisting of who accessed and what information and when. It can also help ease fears over confidentiality and promote a trusting environment.

The HIPAA security standards made it a law that all “covered entities” that transmit and store protected health information in electronic form must comply with the regulations by April 21st 2005. The smaller health care plans were to have complied with these regulations by 21st 2006 (Health and Human Services, 2001).

“Covered entities” refer to:

- Health plans (a health plan is a generic package of health benefits provided by agencies such as insurance companies, Medicare, Medicaid contractors or governments);

- Clearing Houses (entities that cover electronic healthcare data from one format to another for billing or other purposes); and
- Healthcare providers who electronically transmit health information in connection with certain transactions (including claims for payment, benefit eligibility enquiries, and referral authorization requests) (Morgan-Lynch, 2006).

The standards document requires healthcare providers to comply with three specific areas.

These areas include administrative procedures; physical safeguards and technical safeguards:

- Administrative procedures are actions, policies and procedures put in place to manage the selection, development, implementation, and maintenance of security measures in protecting electronic protected health information. The procedures are also used to manage the conduct of the covered entity's workforce in relation to the protection of that information. These actions include certifications, contingency plans, personnel security and internal audits.
- Physical safeguards are physical measures, policies, and procedures to protect electronic information systems and related buildings and equipment from natural and environmental hazards and unauthorized intrusion. Physical safeguards are to be implemented using facility Access Controls, policies on workstation use, workstation security - and device and media controls.
- Technical safeguards are the technology and the policy and procedures for the use of protected electronic health information and control access to the needed health information. Technical safeguards cover such areas as access control, audit trails, integrity controls and person authentication and transmission security.

Each category described above has different regulations that need to be complied with. The standards are stated in a technologically independent way giving organisations the latitude of

implementing technology according to levels of their choice. However, a hefty civil monetary penalty will be levied by HIPAA if organizations fail to comply with the regulations (HIPAA, 2007; Morgan-Lynch, 2006; Terry and Francis, 2007).

5.8 Further Standards and Regulations in New Zealand

Contextually, standards in health care are fundamental in making things safer, clearer and more efficient (Cizadlo, 2009). Standards concerning health information emerged only a decade ago. Their emergence is a result of changing technologies and changes in the delivery of healthcare. Health information standards in New Zealand are based on ISO model of standard development and principles (Cizadlo, 2009). The International Organisation for Standardisation formulated three foundational principles for developing standards (ISO/IEE, 1996). These principles include:

- **Consensus** - taking into account the views of all interested parties (for example, vendors and users, manufacturers, consumer groups, governments, testing laboratories, engineering professionals and research organisations).
- **Voluntary** - global standardisation is market driven therefore, it should be based on voluntary involvement and; taking into account the interest in the market place.
- **Industry-wide** - setting global solutions to meet the needs of world –wide customers and industries.

ISO/TR 21548:2010 Health Informatics provides complementary guidelines to ISO/TS 21547 as well as a practical method and tools for the development and management of electronic archives of EHRs (Standards New Zealand, 2010). ISO/TS 21547:2010 Health Informatics provides the basic principles required to preserve securely health records in any format for a long term. It also addresses a holistic process that includes records maintenance, retention, disclosure, and eventually destruction (Standards New Zealand, 2010).

Figure 5.2 shows linkages between government health strategies including information strategies from the various organisations involved in healthcare and healthcare provision. The 2005 New Zealand Health Information Strategy (NZ-HIS) was produced by the Ministry to give a frame-work within which organisations across the health sector will operate (NZ- HIS, 2005). All the strategies are linked to the District Health Boards (DHBs), Public Health Organisations (PHOs) Vendors, Non-Government Organizations (NGOs) and the Accident Compensation Commission (ACC) (New Zealand Ministry of Health, 2005).

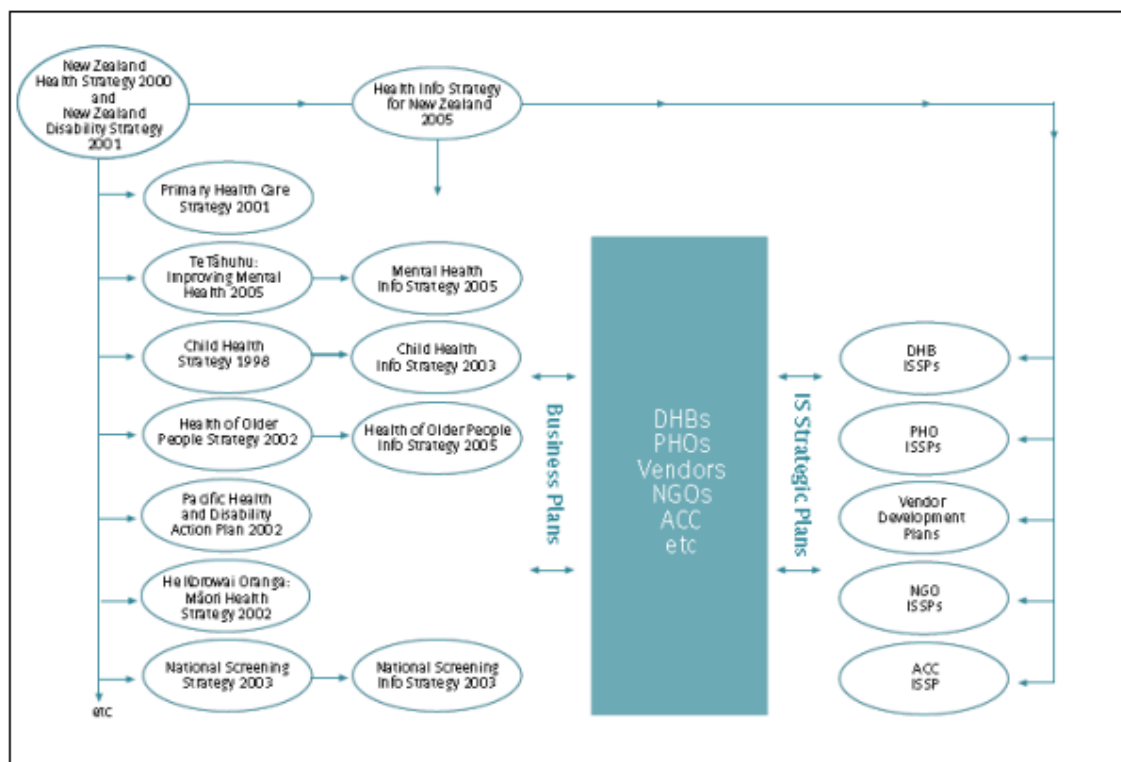


Figure 5.2 Linkages between health strategies and information strategies (Source: Ministry of Health, 2005)

Standards are also established for the networks that are used for the secure transfer of information between healthcare organisations. Such networks include Health Network and HealthLink Private Limited.

5.8.1 HEALTH NETWORK

Health Network was established in 2005. It is an evolution of Health Intranet which had been running since 1999. It is a secure network for the transfer of health information and is the lever for the successful implementation of EHRs in New Zealand. The Health Network provides New Zealand healthcare professionals with a design for the access, secure collection and exchange of electronic health information (Ministry of Health, 2012a).

The Network became part of the Connected Health Network of Networks in December 2010.

Connected Health Network is a network of networks delivered by multiple telecommunications service providers on a competitive basis, using industry standard commodity capability (Ministry of Health, 2012).

The Connected Health Network delivers the foundation components of an interconnected health network to the health organizations. The components include common connectivity frameworks; Network Connectivity Standards [approved by Health Information Service Organisation (HISO)]; core network components including three managed points of interconnection and uniform addressing scheme; an accreditation and certification process for suppliers (telecommunication service providers) and governance and management oversight.

HealthLink Private Limited is one of the Connected Health Network of networks

(Ministry of Health, 2012). The key elements of accepted security policy are shown in Table

5.1

Table 5.1 The New Zealand Network Security Policy for General Practitioners and other Health Professionals (Source: Ministry of Health, 2006)

Principles	Definition	Health Network implementation
Confidentiality	Assuring that message is not readable by unauthorised parties, whilst in transit	Strong Data Encryption using digital Certificates, and associated procedures and policies.
Integrity	Knowing that the message was not damaged or altered whilst in transit	The use of private networks and Digital Signatures
Authenticity	Knowing that the message was not damaged or altered whilst in transit	The use of User ID/Password/or Digital Certificates
Non-repudiation	Providing assurance that the sender cannot: <ul style="list-style-type: none"> • claim the message in counterfeit • deny the fact that the message was sent or received 	The use of secure private networks and Digital Signatures
Auditing	Recording of user connectivity and site access	Logging is undertaken at sites and by the network provider, and can be made available for audits.
Accountability	Identification of clear responsibilities of organisations and individual users	Thorough compliance with legislation and Health Network Security policies

In order to maintain the privacy and trust of the patients when using the New Zealand Health network, the network equips health care organisations with a variety of capabilities ranging from access to National Health Index number(NHI); Professional health Index number (PHI); Pharmac Special Authorities; and to provision of data to Health PAC payment systems (Ministry of Health, 2012).

There is no need for users of the Health Network to be aware of technical intricacies of network, the network providers are accredited and are supposed to provide a secure environment in line with agreed standards prior to any further approval process. These standards are important as healthcare providers are able to communicate and coordinate patient care in a secure manner. Patient safety can also be assured in this scenario.

5.8.2 HEALTHLINK

HealthLink is a privately owned network that deals with electronic messaging traffic and exchange within the health sectors in New Zealand. It is used by the healthcare providers for the electronic transfer of all outbound correspondence from hospitals, communication between GPs, specialist and ancillary care providers in New Zealand and Australia

(HealthLink, 2005; Protti & Bowden, 2010) .

HealthLink services more than 15,000 practitioners from more than 9,000 healthcare organizations in New Zealand, Australia and the Pacific (HealthLink, 2012). It is a network that enables healthcare practitioners to talk to each other and share information electronically and securely. Over 65 million clinical messages have been processed in 2010 alone (HealthLink, 2012). Approximately 100% of New Zealand healthcare providers use HealthLink. Figure 5.3 below illustrates an overview of the type of network that HealthLink implements.

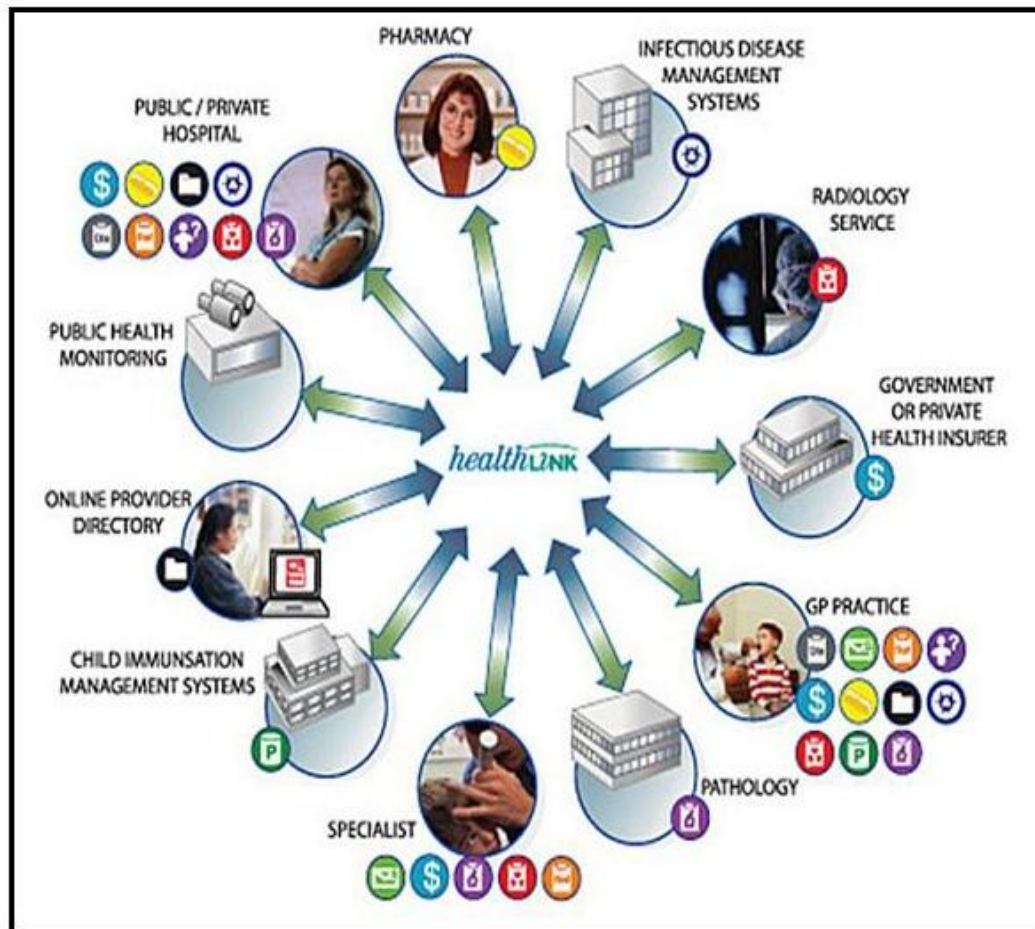


Figure 5.3 Source: An overview of HealthLink networks (2002).

The diagram shows how different members of the healthcare organisations are able to link up via, the HealthLink interface, allowing for an efficient transmission of health consumer information. However, it is important to note that HealthLink is not an EHR system; it is only an electronic message integrator that allows healthcare providers to exchange information regarding a patient/consumer's health among the relevant people. The significance of HealthLink to EHRs is in its security system. HealthLink's integrated health information system (HIS) is an aggregation or network of sub systems such as an individual GP's EHR system. Each sub-system must interoperate with other parts of the system so that it delivers the over-arching functionality required by the users of the network (HealthLink, 2010).

To successfully integrate health information for the improvement of patient safety, health system efficiency and an overall performance in health care, a health system integrator (HSI) is recommended. However, a closer look at the figure above shows that one of the most important stakeholder, the patient is absent. (Hunter, 2002) commented in her report to the Privacy Forum that in New Zealand there is minimal involvement of the patient in the development and planning of IT projects. For examples Hunter (2002) cited the public's limited awareness of NHI. However, Figure 5.4 illustrates how the health sector is not only about integration but is also about human relationships and trust.

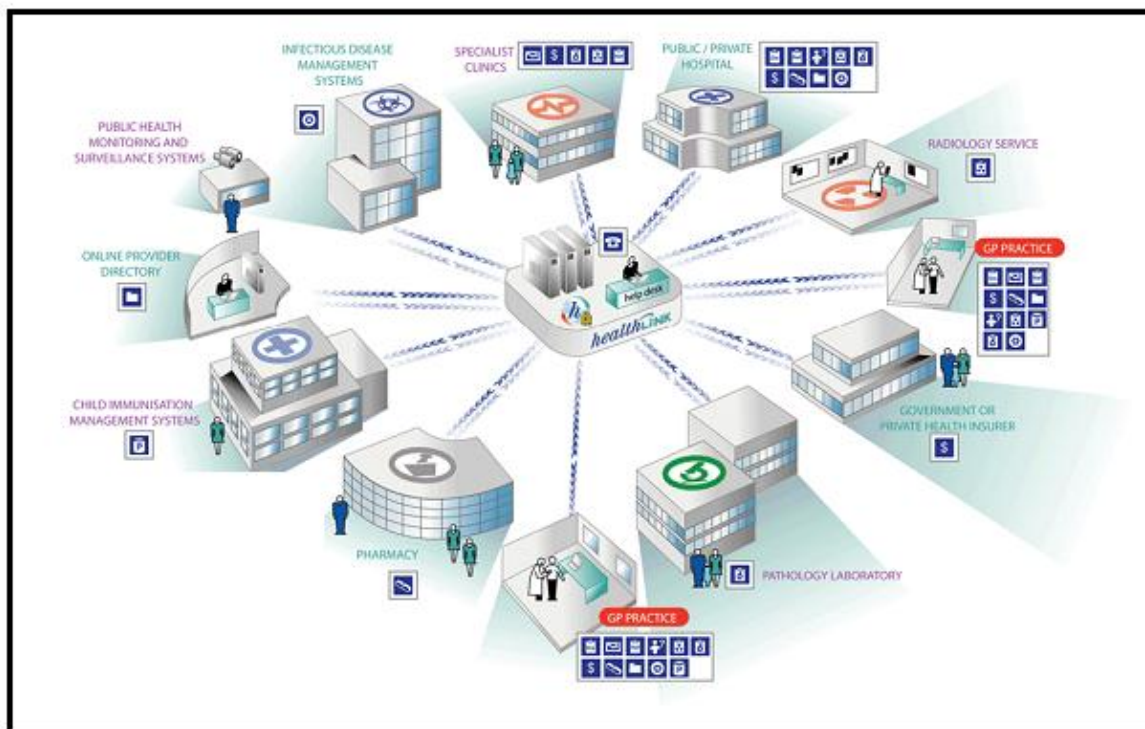


Figure 5.4 Showing how relationships are integrated in the health sector (Source: HealthLink, (2010)).

A good example of how a system-integrator works is in a message validation. As there are so many different parties communicating huge volumes of complex information, it is important

that the receiving clinical system accurately processes “message elements” into the correct fields, and, eradicates any ambiguity about the meaning of the data. The process to arrive at Semantic Interoperability depends on both the development of messaging standards and the way in which the standard is implemented. The HIS will ensure that the interest of the wider community is served without influences from any single party, be they a vocal vendor or government agency (HealthLink, 2010). The most common standard used for exchange of information is HL7.

HL7 is an abbreviation for Health Level Seven. It is a standard for exchanging information between medical applications. Examples of HL7 are patient records, laboratory records and billing information (Interface Ware, 2010).

However, HealthLink has its own drawbacks. It is a system that requires the health practitioners to sign up and become members of the network. As can be seen from the statistics given, there is a need for legislation of some sort to ensure that all practices are able to be part of the system. HealthLink is currently showing that it is for the provider. Therefore, does not seem to show any strategy lay out to bring in the consumer as a major shareholder in the transmission of their information. However, the security system that HealthLink implements conforms to the Health Network systems (HealthLink, 2002) The system is called SECURIT.

5.8.3 SECURIT

Established by HealthLink, Securit is a managed service that provides security services to health sector organisations in New Zealand. It allows general practice and other healthcare organisations to connect to the internet in relative security. It is delivered via a piece of computer hardware called a firewall located on the internet. The firewall is managed remotely via a Network Management System located at HealthLink. SECURIT protects healthcare professional communications from computer viruses, the interception of professional communications while on line, and unauthorised access to patient data (HealthLink, 2003).

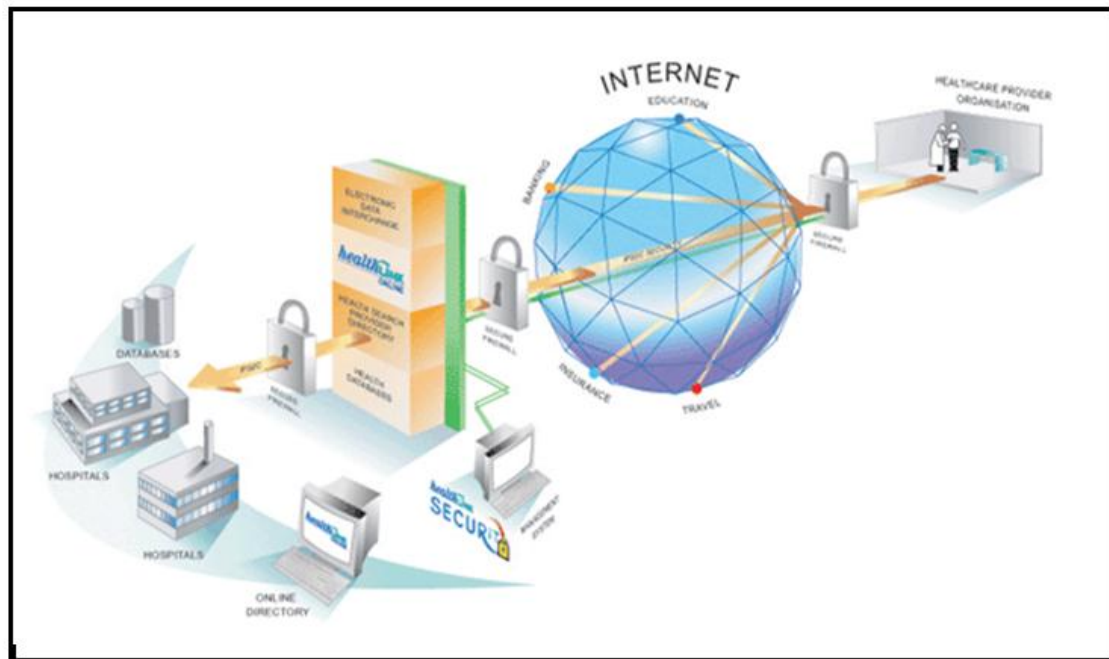


Figure 5.5. The SECURIT system overview (Source: HealthLink, 2002)

The diagram needs a firewall or a Virtual Private Network Management (VPN) device to be installed at every practice that is connected to the network. This will guarantee that all the organisations using the internet are using the same type of technology so that the level of security is maintained throughout the whole network (HealthLink, 2005) Therefore, confidentiality of personal health information will be assured.

5.8.4 Privacy and Confidentiality of Health Information

New Zealand has demonstrated a fairly robust approach to health information although there are some important ethical rules that must be observed in order to maintain the trust and confidence of the consumers in connection with their health information. A study conducted in New Zealand about patients' attitudes towards sharing of their health information has demonstrated that consumers have varying levels of degrees of agreement and comfort about sharing their health information (Widdett et al., 2006).

The respondents indicated that they were:

- Willing to share their health information with health professionals, especially if they were consulted first.
- Willing to share their information with health administrators and researchers if they were consulted first
- Less willing to share information with other organisations (for example private health insurances and government agencies).
- Reluctant to share information when it is of a more sensitive nature except with health professionals especially their GP/practice nurse

(Hunter et al., 2009) conducted another study to investigate similar issues and found that the role of the person requesting the information, the level of identification of health information and the content of the information were all important caveats in the sharing of health information. (I. M. Hunter et al., 2009) also noted that the respondent's age 75 or older or if they were Maori, they were willing to share their personal health information even if they felt less comfortable to do so when health professionals were requesting for the information. The same study found that the 18 – 19 year old age group were less willing to share their health information in any circumstances.

Technologies and the implementation of EHRs have introduced the healthcare sector (Chhanabhai, Hunter, & Holt, 2006). Chhanabhai and colleagues also found that both clinicians and patients had concerns about the security, of unauthorised access to patient health information. Of particular concern to New Zealanders according to Chhanabhai and Holt is the fact that their private health information would be “leaked out” or accessed by unauthorized persons or damaged EHRs software (Chhanabhai & Holt, 2007).

However, Maori also have expressed concern about rights of access to and the use of their personal health information that is stored in individual organisations or centralised database systems. These concerns could be related to rangatiranga whereby Maori are guaranteed the right of ownership over their taonga or knowledge. (Kamira, 1999).

It is important to consider all the issues that have been discussed above because; if a patient does not feel comfortable with the use of their health information; they may withhold sensitive information that is vital to the treatment and care decisions or they may delay or give up treatment altogether (Hunter et al., 2009). Therefore, consideration should be given to the access of personal health information and how it is used to ensure maximum benefits to patients.

Health professionals and health and disability service providers need to act as responsible custodians of consumers' health information (McKenna, 2009). The New Zealand public wants to be informed about how their personal health information will be used as well as being afforded the opportunity to consent or not to consent to those uses. Hence, the New Zealand Health IT Board's vision "to provide high quality healthcare and improve patient safety by achieving a core set of personal health information that is available electronically to [consumers and their] treatment providers regardless of setting as [they] access health services, by 2014" (Ministry of Health, 2010).

King, Brankovic, & Gillard, (2012) conducted a recent survey in Australia about gaining insight into public attitudes and views towards privacy in healthcare. Their results revealed that: 98% of the respondents were in favour of their health information being used for research and 66% expressed concern about privacy of health information. Respondents also showed that they preferred to be consulted before their health information is used for any purposes other than medical treatment (92%); 83% said that they wanted to know the organisation and the

details of the research before allowing the use of their health records. These responses concur with the studies by Whiddett et al., 2006; Hunter et al 2009 and Westin, 2007.

King and colleagues showed that the characteristics of respondents strongly associated with privacy concerns were age, level of education, place of birth and employment status. Another revelation from this same study is that 42-60% respondents expressed concerns about sensitive issues. They believed that there was a possibility of linking de-identified data to patients' names in situations that are not related to medical treatment.

A US survey conducted in March 2007 found that 70% of the US adults' respondents agreed that they were fairly comfortable with how their personal health information was used. One quarter percent of adults had significant issues about the use of their health information (Kane, 2007).

Hence, Kane (2007) concluded that majority of people are ready to accept the potential benefits of EHRs if they were assured that solid privacy and security rules will be put in place. In the same study about one quarter of the American public were sceptical and worried about computerization of health records. However, Kane concurs with Chhanabhai & Holt (2007) who also noted that patients were ready to accept the EHRs if they were assured of the security and privacy of their health records.

In the United Kingdom people were asked to say how happy they would be to allow access to their personal health information. It was found that 90.1% of the respondents were very happy to allow access to their health information and 11.6% would be unhappy to allow access to their health information. The UK study also found that individuals from older people, higher social groups, and males were more likely to be happy about access to their health information. Although there was a high level of support for the use of health information people expressed

that they still wanted to be informed and asked for consent of access to their health information (NHS, 2003).

5.9 Summary

New Zealand has positioned itself in a leading position globally as far as the EHRs implementation process is concerned. Infrastructures such as the Health Information Strategy of 2005; the WAVE report of 2001 and the development of health standards have accelerated the implementation of EHRs (Protti et al., 2009). Health Network and HealthLink ensure a high standard of security protocols for the privacy and confidentiality of health information. The same regulations and acts that govern privacy and security also govern HealthLink and Health Network protocols. The role of HIPAA in regulating the privacy and security of electronic health information in the USA has been noted and has important implications for the New Zealand context.

The health sector is now bearing the fruits of early success in health information strategy and management. Good examples are the PriSm EHR system in the West Coast District Health Board and the TestSafe of Auckland District Health Board (Greenwood, 2007). The NHI number connects all patient documentation in EHR systems ensuring that the results are associated with the correct patient. Another important factor is the Medical Warnings System that is closely aligned with NHI number to healthcare providers warning of any known risk factors that could be important when making clinical decisions about patient care (New Zealand Ministry of Health, 2012).

A large percentage of the public interviewed in a number of studies held positive attitudes towards the use of their personal information. However, nearly all respondents showed that they needed to be consulted before and informed of the use of their information

(King et al, 2012; Widdett et al, 2006; Hunter et al, 2009; Westin, 2007;

Chhanabhai & Holt, 2007).

The next chapter, Chapter Six, will explore how the attitudes of Korean and Chinese community members towards the use of their electronic health information compare with the attitudes revealed in other studies conducted in New Zealand

(Chhanabhai, 2006; Hunter et al, 2009; Widdett et al, 2006).

CHAPTER 6: METHODOLOGY

6.1 Introduction

The purpose of this research is to investigate the attitudes and perceptions that Chinese and Korean groups living in Christchurch, New Zealand hold towards the use of their personal health information held in an electronic record system. The research further attempts to find out how knowledgeable these Chinese and Koreans groups in Christchurch are about EHRs and the use of the national health index number (NHI).

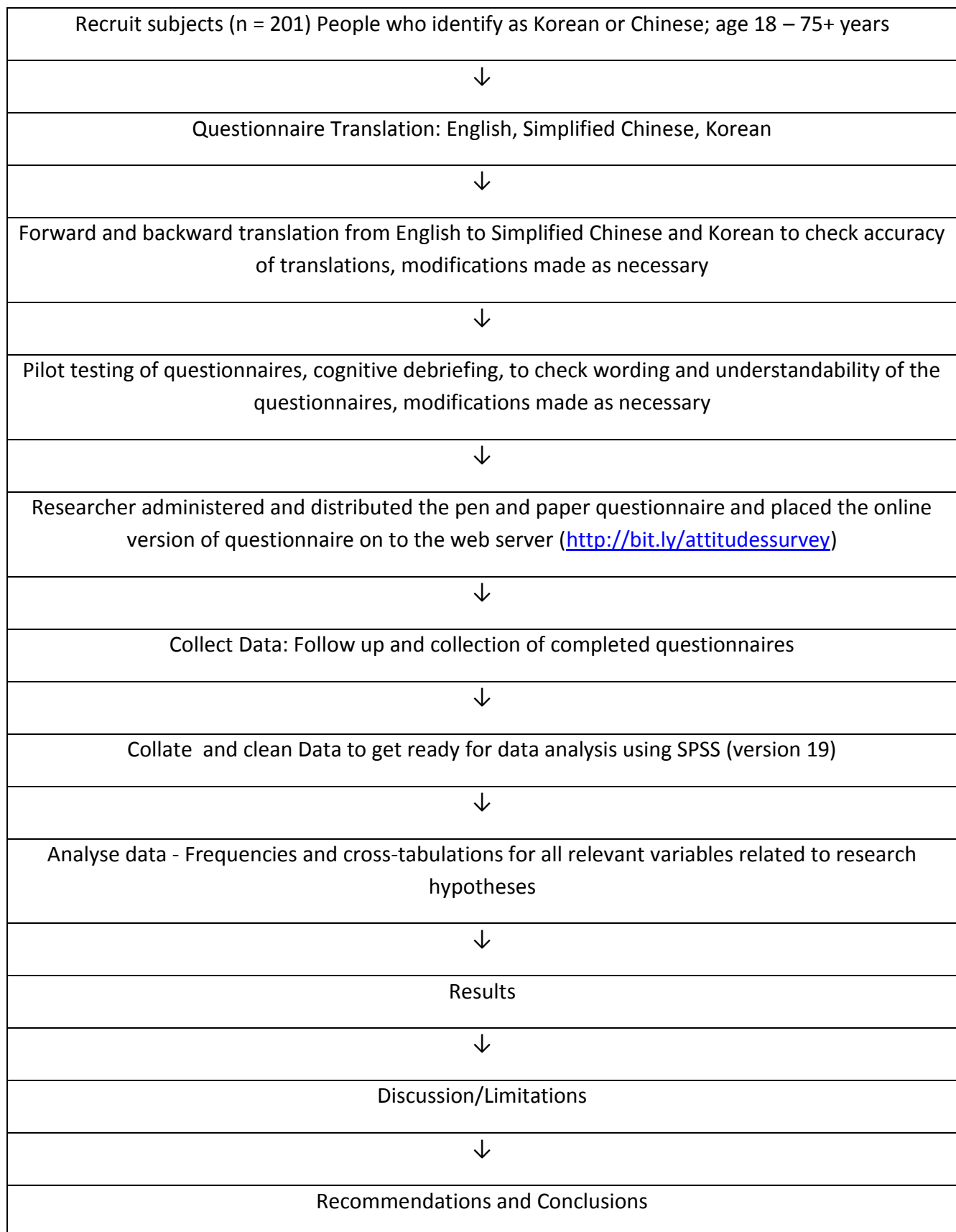
6.2 Study Protocol

Approval for this research was granted on 21 December 2011 by the University of Canterbury Human Ethics Committee. Ref: HEC2011/128. The application also included approval from the Health Sciences Centre, University of Canterbury. Additionally, the research involved the cooperation of Canterbury Partnership Health Organisation who supplied the researcher with translators who translated the questionnaire from English into Simplified Chinese and Korean. The staff at Canterbury Partnership Health Organisation further introduced the researcher to the Korean and Chinese communities to access the individuals who participated in this research.

6.3 The Research Design Flowchart

The research design flowchart is presented in Table 6.1 below

Table 6.1 The research design flowchart



6.4 Recruitment:

The participants for the study were recruited from Chinese and Korean Community churches affiliated to the Canterbury Partnership Health Organisation. However, to increase the number of participants for a better sample size the recruitment coverage was extended beyond the planned communities from churches to include participants from such organisations as Rewi Alley Academy/Rewi Alley Chinese School Christchurch, New Zealand College of Chinese Medicine, Christchurch Traditional Chinese Medical centres; Chinese shops and restaurants; Korean supermarkets, Christchurch Polytechnic Institute of Technology and Thai -Chi Clubs in community church centres.

Participants were also recruited via an electronic version of questionnaire that was made available on the Internet. The online questionnaire was constructed using qualtrics software. The web server was supplied at the bottom page of the pen and paper version of the questionnaire for people who preferred to complete the questionnaire online.

Also posters of the web page (<http://bit.ly/attitudessurvey>) were placed on advertising boards in Chinese and Korean churches in and around Christchurch; on the University of Canterbury notice boards, and in Korean supermarkets around all the shopping malls in Christchurch. Advertisement for the recruitment of participants was also run in the Chinese and Korean weekly press for four consecutive weeks. Other sites where the advertisement took place were Psychology and postgraduate departments of University of Canterbury web pages, and the Christchurch Polytechnic Institute of Technology.

The Canterbury Partnership Health Organisation – Te Kei O Te Waka was a non-profit organisation launched in 2004. The organisation worked with Pegasus Health, General

Practitioners and other community based health providers to coordinate the delivery of primary healthcare to people in and around Christchurch, New Zealand. The organisation's main objective was to make a positive impact on the life and health of people who are affiliated members of the Canterbury Partnership Health Organisation (PHO). These communities include Asian, Maori and Pacific Islanders; but for this study the focus is on the Asian community. Since this research was undertaken the Canterbury PHO has joined with Pegasus Health to form a new alliance.

6.4 Screening and cleaning Data

The pen and paper questionnaire version was converted into an electronic online version. The pen and paper version matched the online format. The researcher with the assistance of the University of Canterbury Statistician cleaned the data to check for errors before the analyses started. It is always important to check for errors as errors can produce inaccurate results and interpretations. For example, if you enter 45 when you intend to enter 4 will distort the results of the analysis ([Pallant, 2007](#)). The following steps are important in the data cleaning processes:

1. Checking for errors such as searching for variables that are out-of-range (not within the range of possible scores). For example, if gender is coded 1 = female and 2 = male there should not be any scores other than 1 or 2 for this variable.
2. Finding out where in the data file the error has occurred.
 - Then finally correcting the data file itself ([Pallant, 2011](#)).

6.5 Coding

Coding involves defining and labelling each of the variables and assigning numbers to each of the possible responses. For the online version responses were automatically coded by the

computer software. The researcher assigned an ID to the pencil and paper version to match the coding of variables in the online version of the questionnaire.

6.6 Questionnaire Design

The questionnaire design consisted of twenty-seven questions which were sourced from Statistics New Zealand (2006), Chhanabhai (2006) and the EQ- 5D-5L (2011). Permission to use these questions was sought from the different original sources and was granted. Some of the questions were modified to suit this research. The whole questionnaire is made up of closed-ended questions, partially closed-ended questions and open-ended questions

([Taylor-Powell, 1998](#)). EQ-5D-5L is designed as a general health quality of life questionnaire to be used for a general population. It is simple to understand and takes only a few minutes to complete (<http://www.euroqol.org/about-eq-5d/valuation-of-eq-5d.html>).

The languages of the questionnaire chosen were in the participants' arterial languages (Korean and Simplified Chinese) and English. The details of the questionnaire versions are found in Appendices: A English version; B Simplified Chinese version and C Korean version. Each questionnaire had an information sheet attached. As the questionnaire was anonymous, participation meant that subjects had consented to take part in the survey therefore no consent forms were issued. The information sheet was also written in the three different arterial languages (Appendices D, E, and F).

6.7 Instrument of the Study

The study instrument was divided into four different sections:

1. Utilisation of health services and Health State, Quality of Life (Questions 1, 2, 3,...12)
2. Electronic Health Records (a record of a patient's health information) held in an electronic format, not in a paper record (Questions 13 to 19).

3. Demographic information (Questions 20 to 27).
4. Open-ended self-reflection question.

The first set of questions asked participants if they have made use of health care services in the last twelve months. Studies in New Zealand have indicated that Chinese and other Asians are less likely to have a usual carer or to have seen a doctor in the last 12 months than other New Zealanders ([Ministry of Health, 2006](#)).

A. Anderson (2008) collated information from New Zealand Asian migrants about utilisation of health care services and found that Asian groups had low use of primary health care services.

The same study also showed that Chinese and Koreans formed the top two largest groups of the New Zealand Asian community. [Howden-Chapman \(2005\)](#) noted that disparities in healthcare utilisation between migrants and host population are an international concern.

Hence, chapter two discussed The New Zealand Health Strategy 2000 that aims at providing a framework for health care organisations to work towards improving health care and reducing health inequalities. The Primary Health Organisation policy of 2002 ([Ministry of Health, 2001](#)) also proposed a scheme to improve access and provision that encouraged patients to use GPs as their first point of contact within New Zealand's health care system (Anderson, 2008).

Participants were given an overview of proposed benefits and problems that EHRs may face.

Security is the main focus in this section therefore participants answered questions about security scenarios that are associated with EHRs. A detailed discussion about various standards surrounding security and confidentiality of EHRs was presented in chapter 4

(Erbschloe, 2005; Chhanabhai & Holt, 2007; Lehtinen et al., 2006). It is important to investigate how much Chinese and Koreans utilise the health care services as this is where the connection of health information and EHR system, privacy and security issues arise from.

The questions in the section on security of EHRs have used the Likert rating scale. Likert Scales are commonly used with attitude scores ([Croasmun & Ostrom, 2011](#)). A likert-type scale requires a person to respond to a series of statements by indicating whether she or he strongly agrees, agrees, neutral, disagrees or strongly disagrees with the presented statements ([Gay, Mills, & Airasian, 2009](#)).

The scale also allows respondents to commit to a certain position even if they may not have a definite answer ([Brown, 2000](#)). By providing participants with a neutral response option, they are not required to decide one way or another on the issue. This may reduce the chances of response bias which has a tendency to favour one response over the other on an issue ([Fernandes & Randall, 1991](#)). Participants also do not feel obliged to have an opinion if they do not have one. The use of negatively worded and positively worded items in survey instruments have also been believed to reduce response bias ([Spector, 1992](#)).

6.7.1 Questions and research hypotheses

This section provides the justification or research hypothesis associated with each questionnaire question or group of questions.

Questions 1 to 3: (utilisation of health care services).

Question 1 Do you have a health practitioner or service, for example, a doctor or nurse or other services that you usually go to when you feeling unwell or are injured?

Research hypothesis: Females are more likely to have a health practitioner or a service that they usually go to when they are unwell than men.

Question 2 What sort of practitioner is this?

Question 3 Over the last twelve months, has a practitioner (For example, a doctor, nurse or other practitioner) either carried out or arranged for you to have any of the following?

Research hypothesis: Females are more likely to have a general practitioner (GP) and more likely to have had a health practitioner carry out test/examinations over the last twelve months than males.

Studies have shown that females use more health care services than males.

[Bertakis, Azari, Helms, Callahan, and Robbins \(2000\)](#) investigated new adult patients on their use of health care services and found that women had higher medical care utilisation than men. They also found that women had significant lower self-reported health status than men.

Questions 4 to 9: (Health States (EQ-5D-5L)).

Question 4: Mobility (your physical ability to walk about and to move around)

Question 5: Self-care (Your independence in daily personal care)

Question 6: Usual Activities (For example, work, study, house work, and family or leisure activities)

Question 7: Pain/Discomfort (Physical or bodily hurt or an uncomfortable physical sensation)

Question 8: Anxiety/Depression (Physical sensation relating to “worry”)

Question 9: To help people to know how good or bad your health is, we have drawn a scale on which the best states you can imagine is 100 and the worst state you can imagine is 0. We would like you to indicate on this scale how good or bad you would say your health is today.

Research hypothesis: Men will have higher self-reported positive health status compared to women.

Questions 10 to 12: (utilisation of Complementary or alternative health care services).

Complementary or Alternative Health care practitioners; Questions 10, 11 and 12

Question 10: In the last months, did you see any complementary or alternative health care worker or a traditional healer, for example, Chinese or Korean traditional practitioners such as those in Diagram ACP below.

Question 11 Who are those you visited in the last 12 months?

Question 12 For all seen in question 11, how many times have you seen each of them in the past twelve months?

Research hypothesis: a) Both males and females will utilise the complementary and alternative medicine and CAM practitioners. b) Age will have effect on the utilisation of CAM. Persons aged ≤ 46 years will use CAM more than persons aged ≥ 46 years.

[Hanyu, Smile, and Hardy \(2002\)](#) measured utilisation of complementary and alternative medicine (CAM) by the US adults. The study found that those who were contemplating the use of CAM were lower than had been reported in previous studies. They found that the use of CAM was most prevalent in women and persons aged 35 to 54 years. The three most popular therapies were spiritual healing (13.7%), herbal medicine (9.6%), and chiropractic therapies (7.6%).

Questions 13 to 19: Electronic Health Records: (a record of a patient's health information) held in an electronic format and not a paper record.

Question 13: Your computer use (Regularly, Fairly regularly, Sometimes, Seldom and Never)

I use a computer

I use e-mail

I use the internet

I buy things on the internet

Research hypothesis: Use of computers will not affect the views of participants in having their personal health information stored in an electronic health record.

As this question focuses on the different uses of computers by participants, it is anticipated that participants are proficient in computers and will have a greater understanding of electronic activities resulting in participants being less apprehensive over security concerns. People who buy things on the Internet are more likely to have greater awareness of security protocols for the Internet than those who use the Internet less often.

Question 14: Security and your medical records.

Are you concerned about confidentiality of your medical records?

Research hypothesis: Many health consumers will be concerned about security and confidentiality of their health information.

The strategic efforts of health information in an electronic record format bring advantages of improved quality and reduced costs of health care. However, health care consumers are concerned about greater risks of loss of privacy of their health information

[\(Barrows JR & Clayton, 1996\)](#).

Do you know about the National Health Index?

Research hypothesis: Although it is estimated that 98% of New Zealand health consumers have a national health index (NHI) number, most people will not understand what the NHI is or what their own NHI number is.

As discussed in chapter 2, the NHI number is a unique number that is assigned to each individual using health and disability support services. The NHI enables an individual to be identified uniquely for the purposes of treatments and care, and for maintaining medical

records. It makes it possible for healthcare providers to know that they are talking about the same health patient and therefore this will help in minimising medical errors. Thus, NHI number has a pivotal role to play in the implementation of EHRs.

Question 15: Considering your health information, had you ever heard of electronic health records?

Research hypothesis: Most participants in the Chinese and Korean ethnic groups will have little or no idea of what EHRs are and this might influence their perceptions about electronic health records.

Having knowledge about EHRs will show that the person understands the principles behind their use. The knowledgeable people will be able to understand both the proposed benefits and anticipated problems of EHRs. This will provide a positive outcome as one study by Westin (2007) found that when most American health consumers had not heard about EHRs, they expressed negative attitudes towards the security of EHRs.

Question 16: The following are proposed benefits to **YOU** of electronic health records. How do you feel about them? (Using the Likert scale: strongly agree, agree, neither agree nor disagree, disagree strongly disagree).

Giving you access whenever you need to make decisions about your treatment.

Giving those who treat you after normal hours access to your health records to make decisions about your treatment

Enable you at any time to look at your medical history

Enable you at any time to look at your current prescriptions and dosages

Enable you to see your recent results

Quicker access to your test results

Allow you to choose who can and cannot see your health records

Allow you to make or change appointments online for GP or hospital visits

Enable you to record your wishes (e.g. organ donor or life Support)

Research hypothesis: The proposed benefits are all patient focused; hence it is likely that most patients will all agree that EHRs will provide them with most the benefits that have been provided.

The aim of the question is to inform the participants on the proposed benefits that EHRs will bring to the health care system. At the same time the question is asking participants whether the proposed benefits would really impact on their attitudes positively. These proposed benefits have been collected from the previous study by Chhanabhai (2006).

Question 17: Despite the proposed benefits that have been mentioned, there are also anticipated problems with electronic health records. How do you feel about them?

Research hypothesis: When participants are given a list of negative aspects of EHRs they will all agree that EHRs might raise such concerns for them. It is believed that by giving the consumers both the benefits and the problems of EHRs, the research should discover that participants will perceive that there are more benefits to the use of EHRs than there are problems. Therefore, the results may persuade the consumers to embrace the use of the EHR domain. Some of the main focus of the study is to show that privacy and confidentiality issues for EHRs could be resolved as discussed in chapter 4. These problems were highlighted in Chhanabhai (2006); Cunningham (2003) and NHS (2003) as barriers to the acceptance of EHRs use by consumers.

Question 18: Despite the proposed benefits that have been mentioned, there are also some anticipated problems with Electronic Health Records. How do you feel about them?

Research hypothesis: The above were potential problems that may face electronic health records, below is a list of problems that are faced by most current online systems not just electronic health records.

Do you think these would affect **YOUR** electronic health records?

Malicious software (viruses, spyware)

Vendor access to the system (Super users) Vendors are the sellers, suppliers or retailers of the electronic health record system).

Long-term accessibility and storage of information Deliberate acts to harm the system (hackers, crackers).

Failure to backup your medical records.

Research hypothesis: Participants are likely to believe that their medical records would be affected by the problems that were mentioned.

Electronic systems are vulnerable to attacks from various sources. This question highlights common problems that are encountered in the use of electronic systems. Health consumers' perceptions and attitudes are also investigated to see if they will be positive that the problems will affect their health records. Chhanabhai & Holt (2007) found that the participants in their study were mainly concerned about hackers. Seventy-nine percent of the participants from that study believed that hackers would pose huge problems for EHRs. This study will investigate and discover if the same trend as in Chhanabhai & Holt prevails. However, it is anticipated that the bigger the proportion of participants with higher qualifications than high school are more likely to alter the trend. Proficiency in computers

may alter the trend as the more proficiency the participants are the more they are likely to understand the security protocols of the internet.

Question 19: Do you think if the following were implemented your electronic health records will be more secure?

Anti-virus software

Firewall

Restricted system access

Audit trails (so you can see who has been doing what with your record)

Encryption

Research hypothesis: If the consumers are made aware of the security measures that are available they may feel more confident that their record is more secure.

In question 16, details of meaning of each security measure are given to make sure all participants have basic understanding of how each security measure operates. This would minimize the introduction of bias in the results. These security measures are the ones that are likely to apply to the legal obligations for the collection and use of patient information, in New Zealand as determined and applied by the Privacy Commissioner in the [Health Information Privacy Code 1994](#). (Privacy Commissioner, 2008b). It is assumed that by introducing the participants to these ideas of security measures, participants will accept the EHR concept despite the perceived problems mentioned earlier.

Questions 20-27: (Demographic information)

Question 20: My gender is...

Question 21: My age is...

Question 22: Which ethnicity do you identify with?

Question 23: In which country were you born?

Question 24: In which year did you move to New Zealand?

Question 25: In which languages would you have a conversation with about a lot of everyday things?

Question 26: Which is your highest education achieved?

Question 27: Apart from secondary school qualifications, do you have another qualification?

Do not count incomplete qualifications or qualifications that take less than 3 months of full-time study.

The demographic variables were used to provide a breakdown of Koreans and Chinese groups' views over the use of their personal information. The demographic characteristics used include variables such as age, gender, ethnicity, language spoken, and education. The cross-tabulations will give information on cases that have certain characteristics that the study is looking for (pattern and strength of a relationship), (Argyrous, 2011). Some variables were recoded to get them into fewer more manageable categories for analysis in relation to other variables. Where participants had to choose more than one category (e.g. ethnicity) the variables were recoded into 'multiple response variables'.

Research hypothesis: Age allows the research to determine if there are any significant differences shown between different age groups.

It is anticipated that young age groups are more computer literate and tend to use computers on a daily basis and should not probably be as concerned about security of their information as the older age group.

6.8 Data analysis

SPSS Version 19 was used as a statistical analysis program for the whole data analysis process.

Descriptive statistics were used to describe the basic features of the data for each question in this research. Generally, descriptive statistics show simple summaries about the sample and the measures (Argyrous, 2011). In association with simple graphic analysis, they serve as the basis of virtually every quantitative analysis of this data. Frequencies are shown in frequency distribution tables and graphic forms.

Chi-square tests were used according to the research question that the study addressed to examine associations between study variables of interest. The research question invariably directs the researcher's interest to a specific characteristic of the distribution for a given variable. Chi-square tests are the same whether there is one or two or more than two samples (Argyrous, 2011). The main value that is used in chi-square tests is the Pearson Chi-Square value. To be statistically significant the level of significance needs to be 0.05 or smaller. If the value is 0.57 then it is larger than alpha value 0.05, so it is concluded that it is not statistically significant. That means there is no significant relationship between the two variables being assessed. (Pallant, 2007).

The full details of analysis of the results will be presented in chapter 7. Only relevant and completed questions were used to conduct the analysis.

Chapter 7: RESULTS

7.0 Introduction

The methodology chapter focused on the outline of the current study design, the method by which data was collected from the 201 participants, and how the data from paper and pencil was merged with data from the online version. The data was then collated and analysed.

This chapter is comprised of two inter-related sections: 7.1) the descriptive results including: the demographic characteristics of participants, self-rated health states and utilisation of health services, computer use, perceptions of EHRs and EHR benefits and problems; and 7.2) results of chi-square tests and cross-tabulations in relation to the research hypotheses (gender and age were the primary dependent variables).

Following data collection, data was coded and scored/reverse scored according to the positive/negative wording of the research questions. For example, for questions which are negatively worded i.e. 'EHRs can increase medical record errors', a higher score here indicates more negative perceptions of EHRs. This is dealt with by reverse scoring the items, so that higher scores represent more positive views of EHRs. Descriptive statistics will give raw findings of the study followed by cross tabulations and the chi-square statistics.

7.0.1 Margin of Error

When sampling from a population there is an associated margin of error in the sample estimate of the population parameter. For a given sample the margin of error is calculated as:

The margin of error in a sample = 1 divided by the square root of the number of people in the sample. Hence the margin of error for the study sample ($n = 201$) = 7%. That is, we are 95% confident that the true population value of the sample estimate lies +/- 7% from that reported by the sample respondents. For example, if 40% respondents answered a survey question in a

certain way, then we expect with 95% confidence that the true population value is 40% +/- 7% or that it lies between 33% - 47%.

7.1 Descriptive Statistics

Descriptive analyses were carried out to investigate the demographic characteristics of participants.

7.1.1 Demographic characteristics of the sample

The results show that the majority of participants were female (n=108) at 61.4%; male participants numbered 68 (38.6%). The ages of participants ranged from 18 to 76+ years. The highest percentage of participants was in the 18 – 25 year age group (23.4%), followed by the 46 to 55 year age group (20.6%) (Figure 7.1).

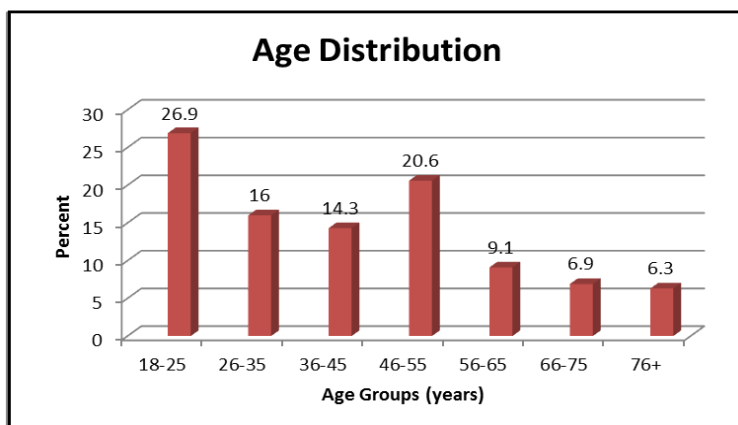


Figure 7.1: The frequency distribution of participants' ages.

In terms of ethnicity the majority of participants (59.1%, n=101) identified as Chinese, and just under a quarter as Korean (24.9%, n=50) (Figure 7.2).

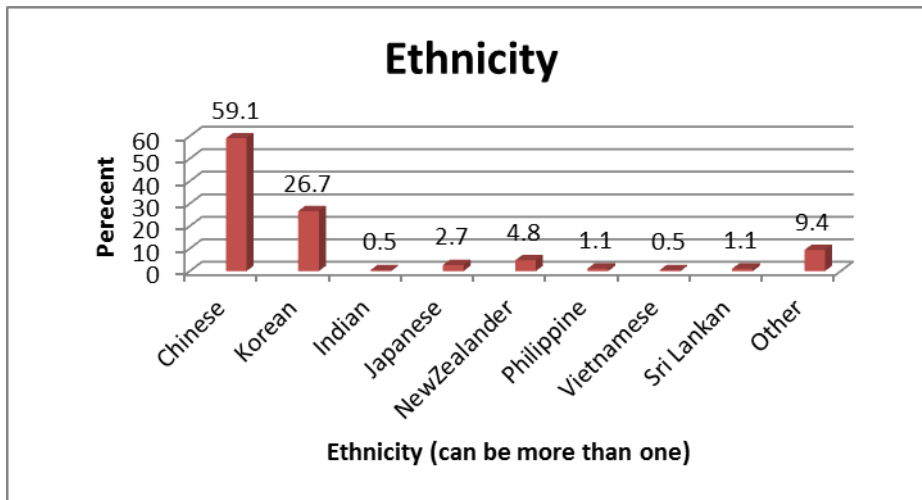


Figure 7.2 Frequency distribution of participants' self-identified ethnicity.

Participants were also asked to show the country in which they were born. The results show that the majority of the participants (59.1%) were born in China and 29.9% in Korea. Participants born in other countries are as displayed in Figure 7.3.

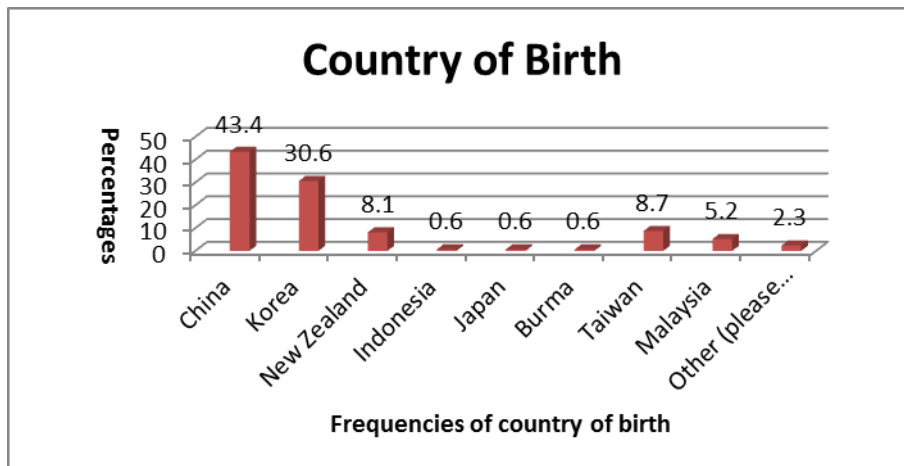


Figure 7.3: Frequency distribution of participants' countries of birth.

Language spoken by different people is important in considering communication of important key information such as planning for provision of translation and interpreting services

(Thorpe, Marr & Richardson, 2007). When participants were asked to show in which language they have a conversation about a lot of everyday things, 60.6% (n=103) indicated that they speak in Mandarin, 30.6 % (n= 52) speak in Korean, and 11.8% (n= 20) in Cantonese. The results also show that 50% (n=85) carry out daily conversations in English and 5.9 percent in other languages (Figure 7.4).

Figure 7.5 presents the percentages of participants whose highest level of education was specified as ‘primary’, ‘intermediate’, ‘high school’, ‘undergraduate’, ‘Bachelor’s’ or ‘postgraduate’. The frequency distribution shows that participants’ highest qualifications range from a Bachelor’s degree at 28.7%, followed by undergraduate at 21.1%, postgraduate at 20.5% and high school at 19.3%. The participants with a lower qualification than high school and tertiary are each below 5 percent (Figure 7.5).

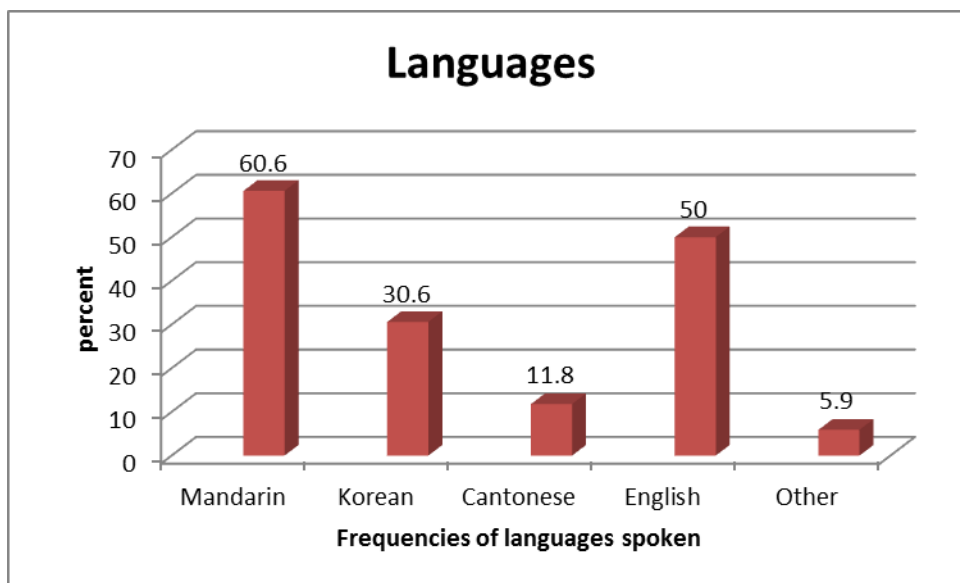


Figure 7.4: Frequency distribution of languages participants use for everyday conversation.

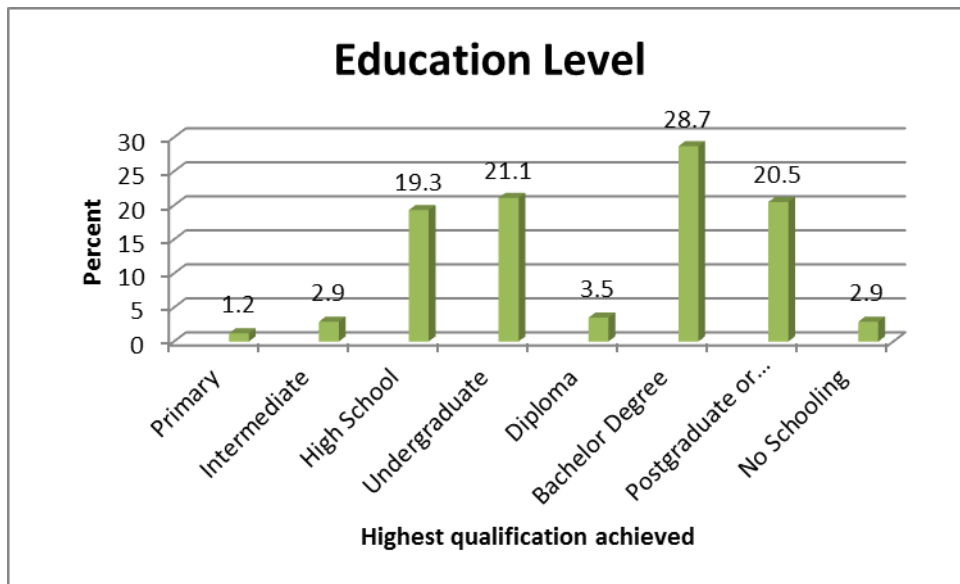


Figure 7.5: The frequency distribution of participants' highest qualification achieved.

7.1.1.1 Summary of demographic characteristics

The survey participants are generally young; with nearly 87% aged 18 to 65 years. Friesen (2008) found that Chinese and Koreans resident in Christchurch are generally young populations; at that time 81% of Chinese residents were aged 15 to 64 years and only 5% were aged 65+ years. 69% of Koreans were aged 15 to 64 years. This study did not disaggregate participants' age according to Chinese or Korean ethnicity, but the respondent group in general reflects the young population age structures reported by Friesen

Most participants were born overseas; 43.4% in China, 30.6% in Korea, and 8.7% in Taiwan.

Overall, 8.1% of the participants were born in New Zealand, fewer than might have been expected given Friesen's (2008) analysis of the Chinese and Korean populations resident in Christchurch. 17% of Chinese and 6% of Koreans were born in New Zealand. Country of origin may also have an effect on language spoken – fewer participants 50% reported that they

could have an everyday conversation in English, compared to 86% Chinese and 71% of Koreans reported by Friesen (2008). Respondents also use the following languages÷ Mandarin (60.6%), Korean (30.6%), and Cantonese (11.8%). It appears that Chinese and Korean participants prefer using their own languages more than English as shown by the percentages. This fits with Chang et al's (2006) findings that Koreans in Christchurch found proficiency in English a challenge.

Fifteen percent of people in Christchurch aged 15 years and over had a university degree, compared to 22% of Koreans and 24% of Chinese (Friesen, 2008). Nearly 50% of the respondents in this study had a university degree, indicating that the respondent group reflects the immigration status (highly-educated recent migrant) discussed in the introduction chapter. Only a total of 7% of the respondents reported primary, intermediate or no schooling.

7.1.2 Use of health services and health state (Survey questions 1-12)

Approximately three-quarters (75.6%) of the sample indicated that they have a health practitioner or a service that they visit when they are feeling unwell. For most respondents (88.7%), their initial visit is to a general practitioner (GP), 13.2% report visiting a traditional medical practitioner. This shows that participants' first points of contact when they are unwell are GPs and traditional medical centres in Christchurch (Figures 7.6 and 7.7).

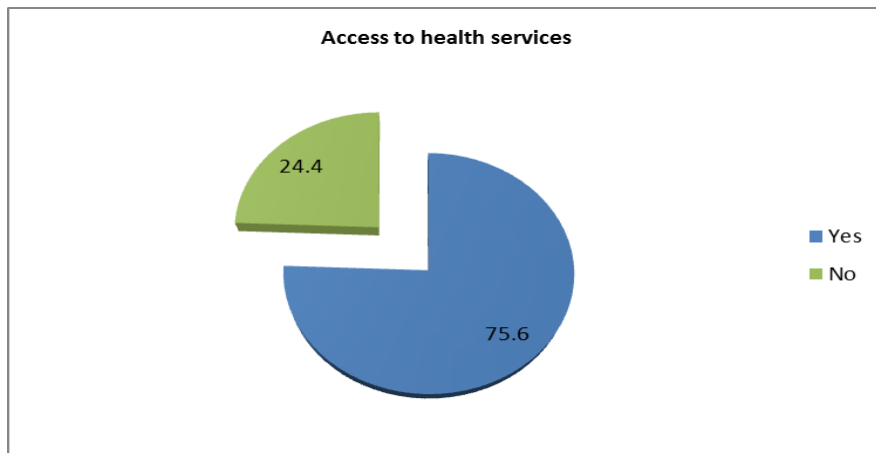


Figure 7.6: The frequency distribution of participants with and without a health practitioner.

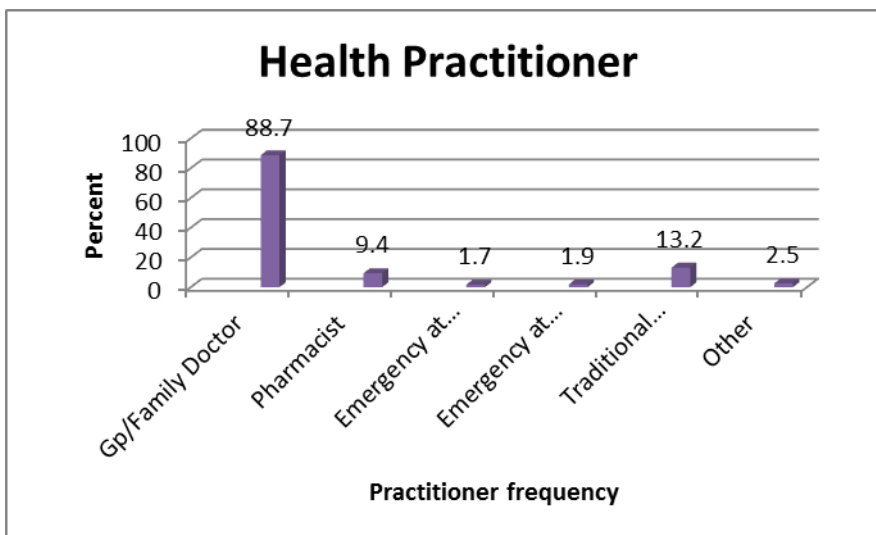


Figure 7.7: The type of health practitioner first visited when feeling unwell.

Approximately one third of the participants (33.7%) reported having their blood pressure tested (Figure 7.8).

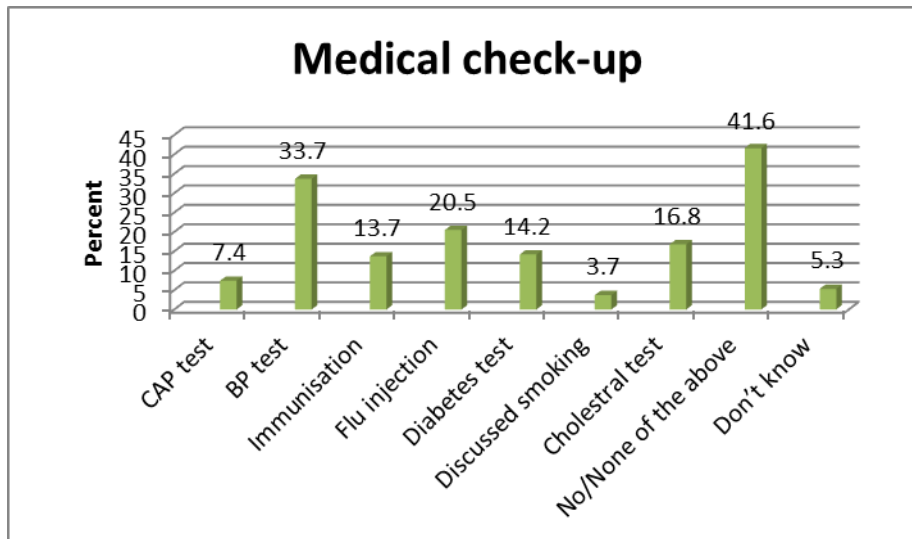


Figure 7.8: Frequency distribution of medical tests reported by participants over the last 12 months.

7.1.2.1 Health states (Survey questions 4-9 (EQ-5D-5L))

The majority of respondents (85.9%, n=165) stated that they have no problems in terms of being able to walk about. Only 1% (n=2) stated that they had severe problems in this respect (Figure 7.9).

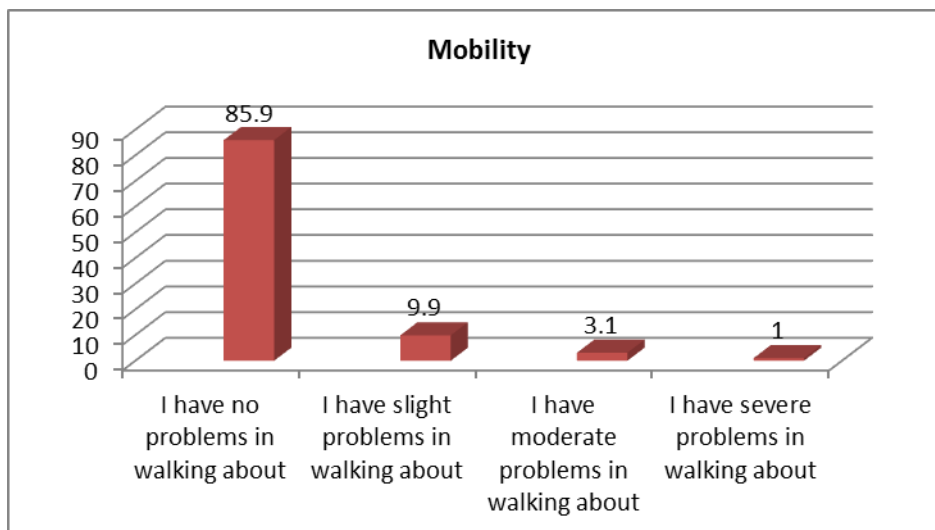


Figure 7.9: Frequency distribution of participants' mobility.

Almost all of the participants (95.8%, n = 184) indicated that they have no problem with washing or dressing themselves. Only 1 respondent (0.5%) reported severe difficulties:



Figure 7.10: Frequency distribution of participants' capacity for self-care.

The vast majority of participants (87.6%, n=169) stated that they have no problems undertaking their usual activities (for example, work, housework, family or leisure activities). Similarly to the responses for walking around/moving about and self-care, one respondent (0.5%) reported experiencing severe problems with their usual activities (Figure 7.11).

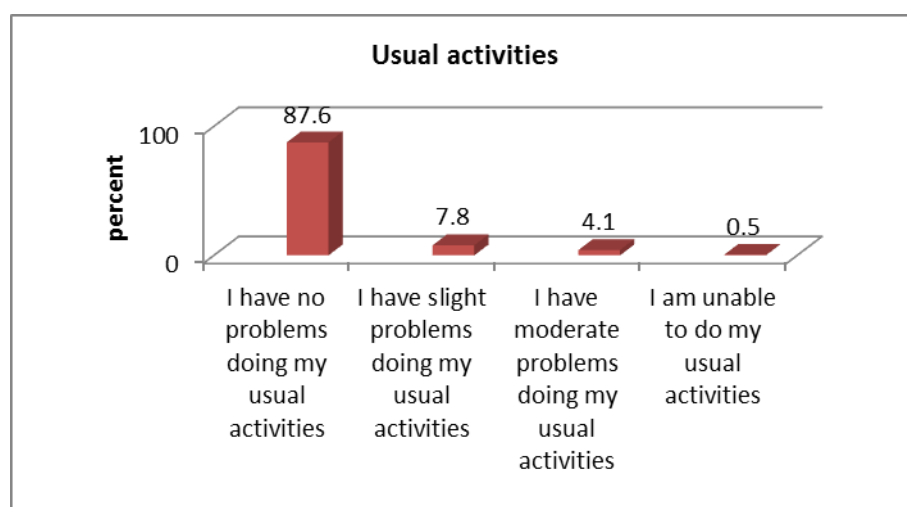


Figure 7.11: Frequency distribution of usual activities.

The pattern of responses to a question about pain/discomfort (physical or bodily hurt or uncomfortable physical sensation) differs somewhat from the trends noticed in mobility, self-care and usual activities, with considerably fewer respondents reporting to be pain/discomfort-free (55.2%, n=106). Approximately 30% (n=58) experience slight pain or discomfort, and 1.6% (n=3) report severe pain/discomfort (Figure 7.12).

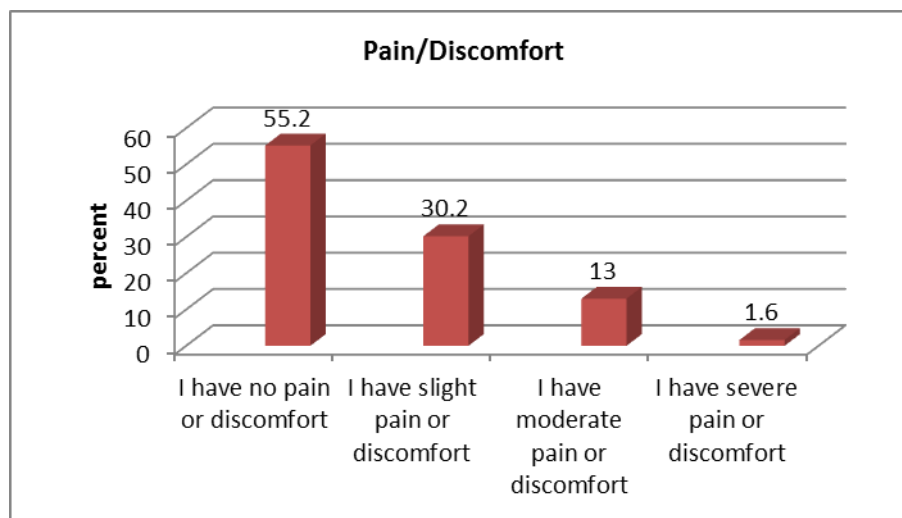


Figure 7.12: Frequency distribution of participants feeling pain/discomfort.

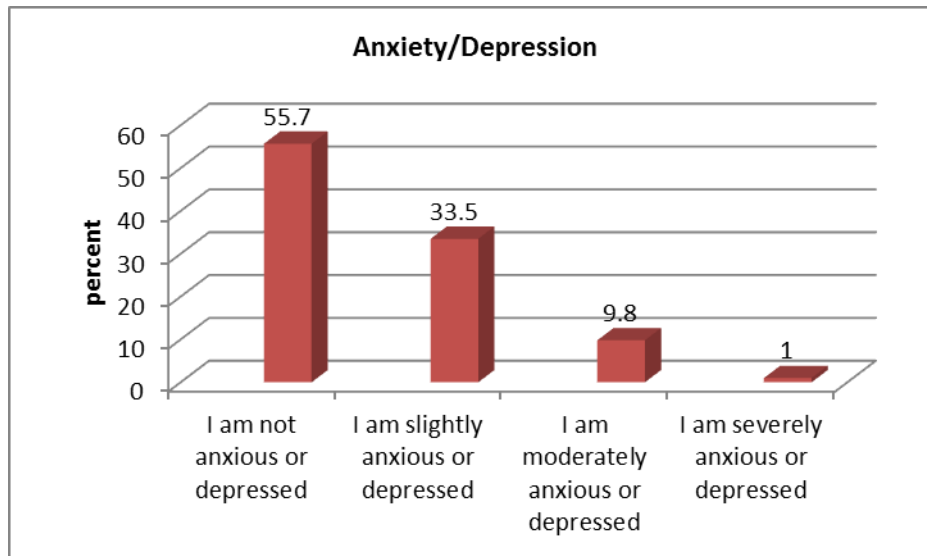


Figure 7.13 Frequency distribution of participants feeling anxious/depressed.

A similar pattern of responses was observed in relation to a question about anxiety/depression (physiological sensation related to ‘worry’). Although just over half of respondents (55.7%, n=108) reported not feeling anxious or depressed, a third (33.5%, n=65) reported feelings of anxiety or depression (Figure 7.13).

More participants reported their states of health as close to the best they could imagine (ranging from about 71 to 95 on the visual analogue scale) than those who reported their health as worse. Thirty-eight reported their health as state as 90 out of a maximum level of 100 (Figure 7.14).

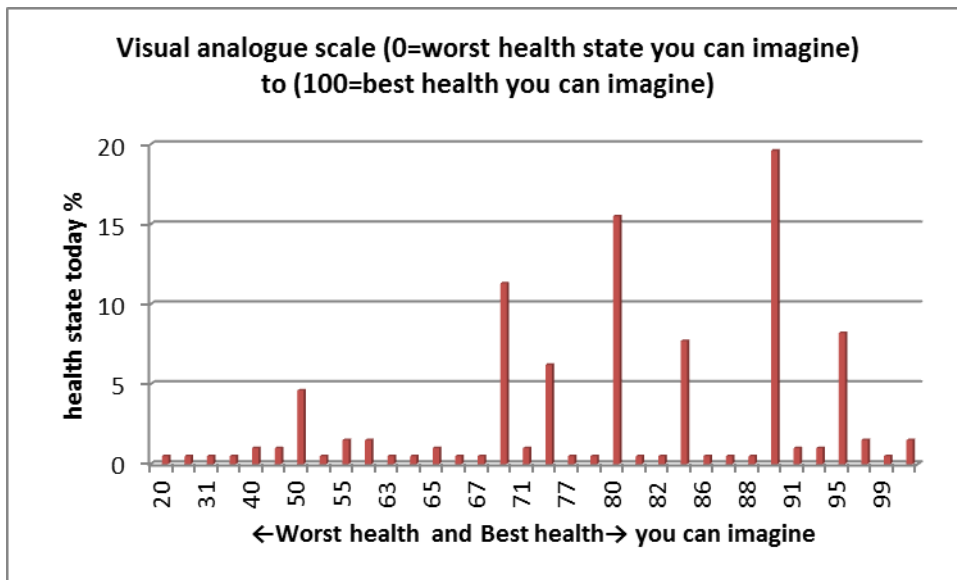


Figure 7.14: Frequency distribution of participants' self-rated health state.

7.1.2.2 Use of CAM practitioners (Survey questions 10-12)

Just a third of participants (34.8%, n=63) revealed that they have visited alternative or complementary health care workers during the past 12 months (Figure 7.15).

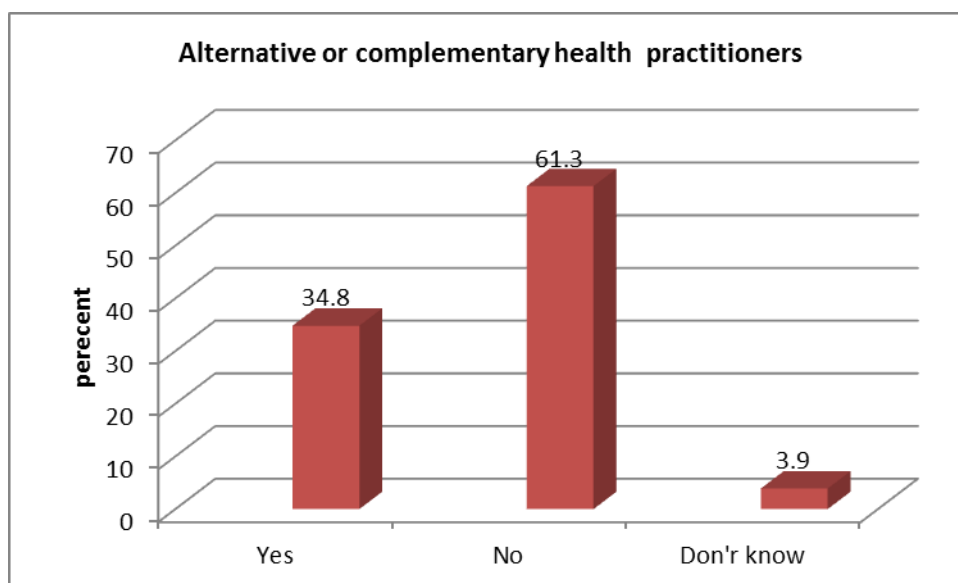


Figure 7.15: Frequency distribution of visits to a complementary or alternative health care worker or a traditional healer in the last 12 months (Chinese or Korean traditional practitioners).

7.1.2.3 Summary of utilisation of health services and health states

This population have shown that there is a relatively high use of health services as 75.6% answered that they have a health practitioner or service they go to when feeling unwell. Nearly 90% of respondents go to a GP as their first point of contact. More than half of this population go for medical check-ups while only 41.6% say they do not go for medical check-ups. The self-reported health states shows that the population is relatively healthy as most participants indicated that they had no problems with their health states (mobility, self-care, usual activities, pain/discomfort and anxiety/depression).

7. 1.3 Electronic health records (Survey questions 13-19)

7.1.3.1 Computer use (Question 13)

Computer use is a commonly investigated variable in the study of healthcare technology awareness and use. In this sample, participants were asked to rate their frequency of use of computer, email, internet and online purchasing using value labels ‘regularly’, ‘very regularly’, ‘sometimes’, ‘seldom’ and ‘never’. Just over half of respondents report using a computer regularly (60.9%, n=103), and less than 10.7% of respondents (for each option) report that they “sometimes,” “seldom, or “never” use a computer (Figure 7.16).

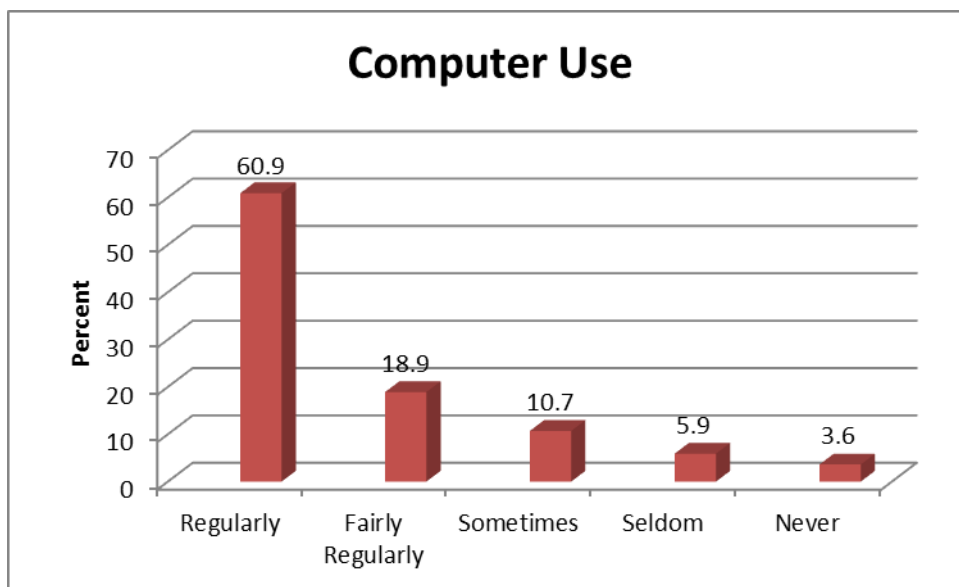


Figure 7.16: Frequency distribution of participants’ use of a computer.

Figure 7.17 shows that there are a small number of participants who seldom or never use email. Participants who regularly, fairly regularly or sometimes use email account for the majority of responses, with 56.6% (n=90), 22.6% (n=36) and 10.7% (n=17) respectively. Those who seldom or never use are each below 10%.

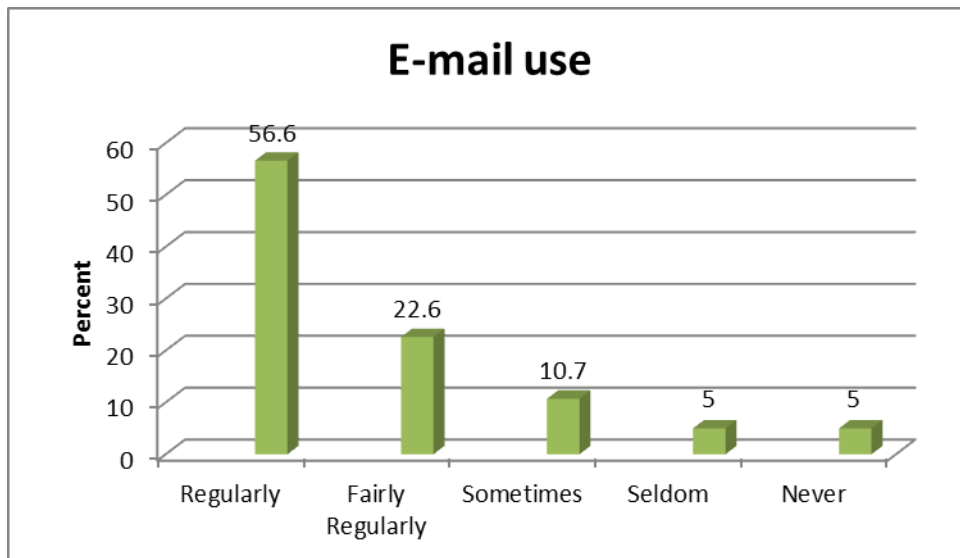


Figure 7.17: Frequency distribution of participants' use of e-mail use.

The internet is an important means of communicating and accessing information. It may also help people to stay informed, make decisions and keep in touch with others. Responses indicated that about 60.3% (n=94) of participants use the internet regularly, and 20.5% (n=32) use the internet 'fairly regularly' (Figure 7.18).

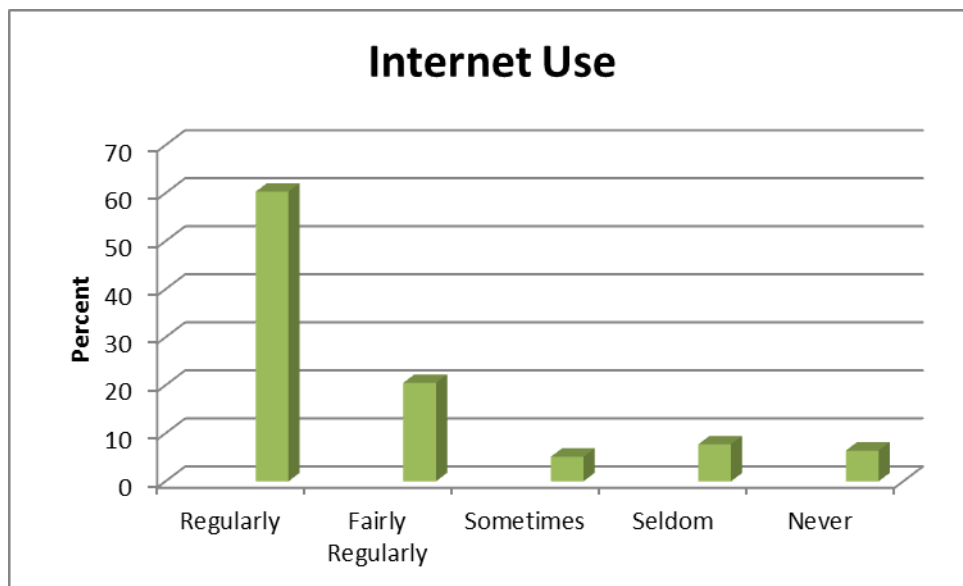


Figure 7.18: Frequency distribution of participants' use of the internet.

A slightly different trend was found in the frequency distribution of respondents' use of the internet to purchase goods, with the largest proportion (30%, n=45) reporting that they seldom use the internet to purchase goods (Figure 7.19).

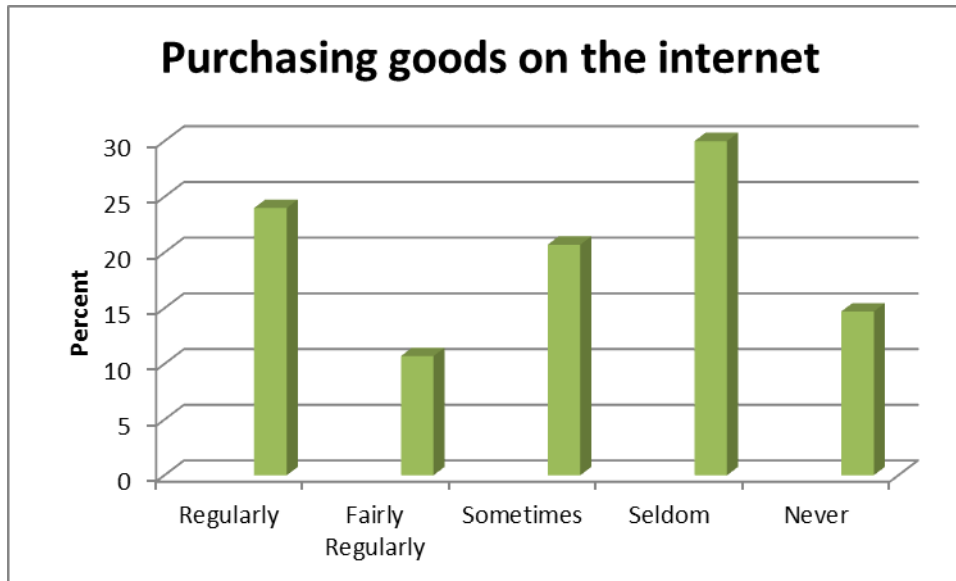


Figure 7.19: Frequency distribution of participants' use of the internet to purchase goods

7.1.3.2 Security and confidentiality of medical records (Question 14)

Question 14a research hypothesis: Many health consumers will be concerned about security and confidentiality of their personal health information.

When participants were asked to express how they feel about the privacy and confidentiality of their health records, it was found that relatively equal numbers of participants are concerned (42.4%, n=72) and not concerned (44.7%), with 10.4% of the sample not sure about their concerns (Figure 7.20). The slightly lower number of concerned respondents compared with those not concerned does not support the original research hypothesis.

Question 14b research hypothesis: Although it is estimated that 95% of New Zealand health consumers have a national health index (NHI) number, the majority of participants will not be aware of the National Health Index.

When asked, over two-thirds of respondents (67.3%, n = 113) reported not knowing about the National Health Index, compared to only 14.3% (n = 24) reporting some knowledge/ awareness

(Figure 7.21). This finding would appear to support the initial research hypothesis. This could be a general indication that not many Chinese and Korean people are aware of the number and its purpose.

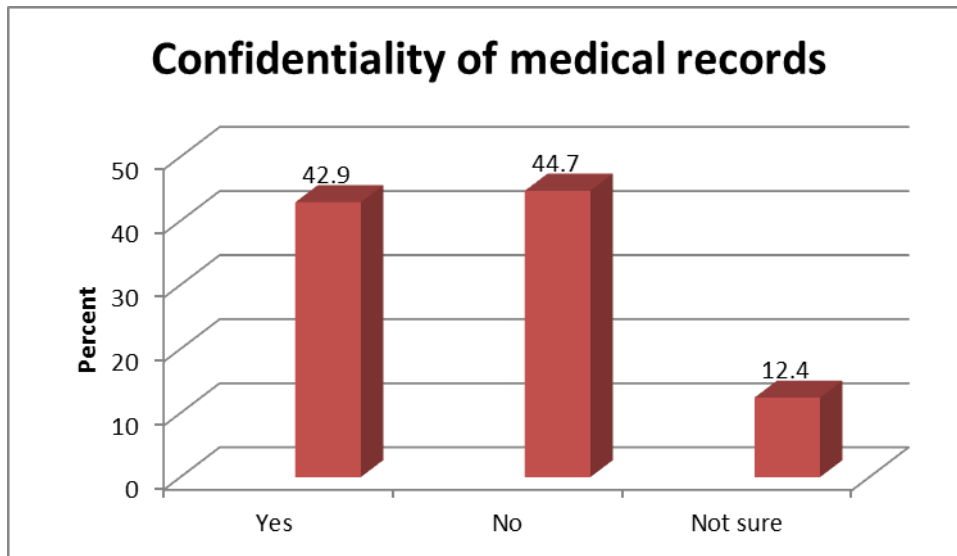


Figure 7.20: Frequency distribution of participants' concerns for the confidentiality of their medical records.

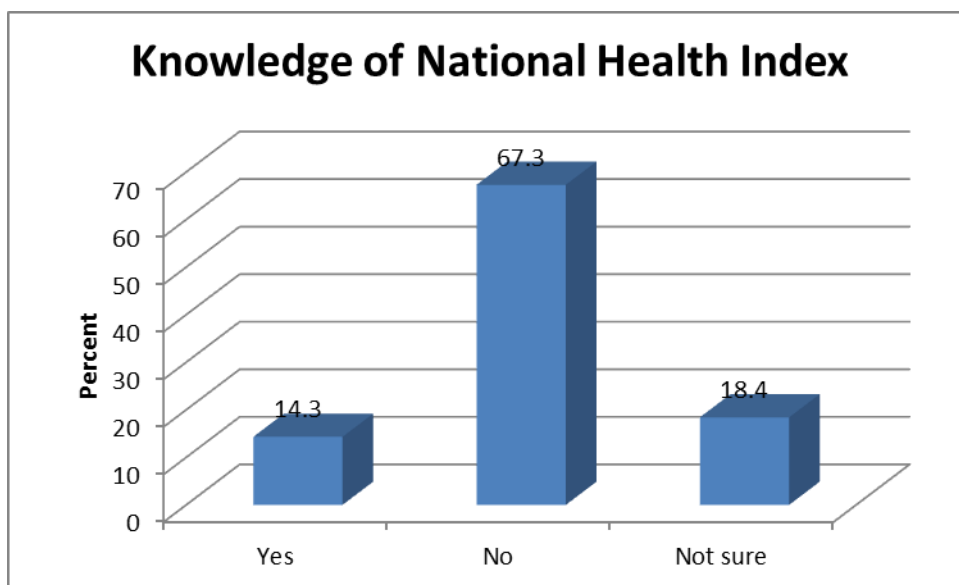


Figure 7.21: Frequency distribution of participants' knowledge of the National Health Index.

7.1.3.3 Awareness of Electronic Health Records (Question 15)

Question 15 research hypothesis: The majority of participants will have little or no knowledge of EHRs, and this will influence their perceptions about electronic health records negatively.

Participants were asked about their knowledge of EHRs before completing questions about the EHR presented in the questionnaire; in support of the first part of the research hypothesis, nearly three-quarters of participants (72.5%) indicated that they had never heard of EHRs (Figure 7.22).

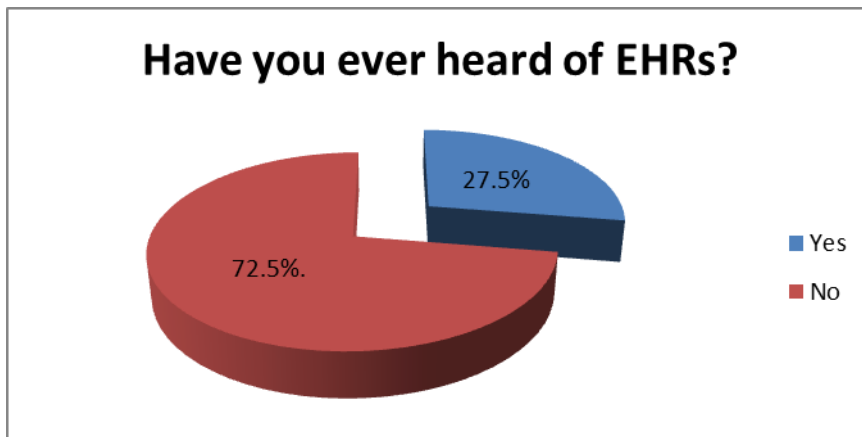


Figure 7.22: Pie graph depicting participants' knowledge of EHRs.7.1.3.4

Proposed benefits of Electronic Health Records (Question 16)

Question 16 research hypotheses: The proposed benefits of EHRs are all patient-focused; it is likely that most patients will agree that EHRs provide a range of benefits (as per a list provided).

Participants were given a list of proposed benefits of using EHRs. Despite a large number of participants indicating that they had never heard of EHRs, the results show that a majority of participants (78.7, $n = 133$) agree or strongly agree that EHRs deliver the benefits mentioned (Figure 7.23). These results and those relating to specific benefits support the research hypothesis.

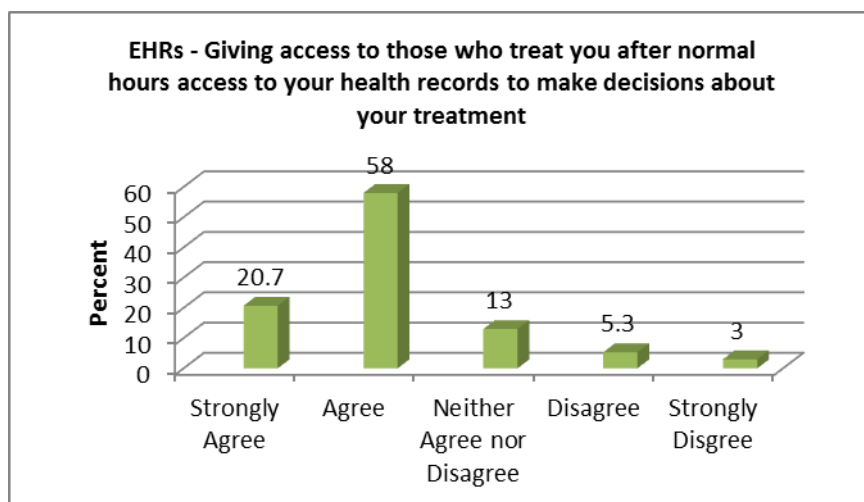


Figure 7.23: Participants' perceptions of EHRs benefits – giving participants access whenever they need to make decisions about their treatment.

Figure 7.24 shows that a majority of participants (78.7%, n= 133) agree and strongly agree that EHRs may give those who treat them after normal working hours access to their medical records to make decisions about their treatment.



Figure 7.24: Participants' perceptions of EHR benefits – access to medical records for those who treat participants after normal working hours.

Figure 7.25 shows that approximately 88% of respondents strongly agree or agree that EHRs will give them the opportunity to look at their medical history any time they need to.

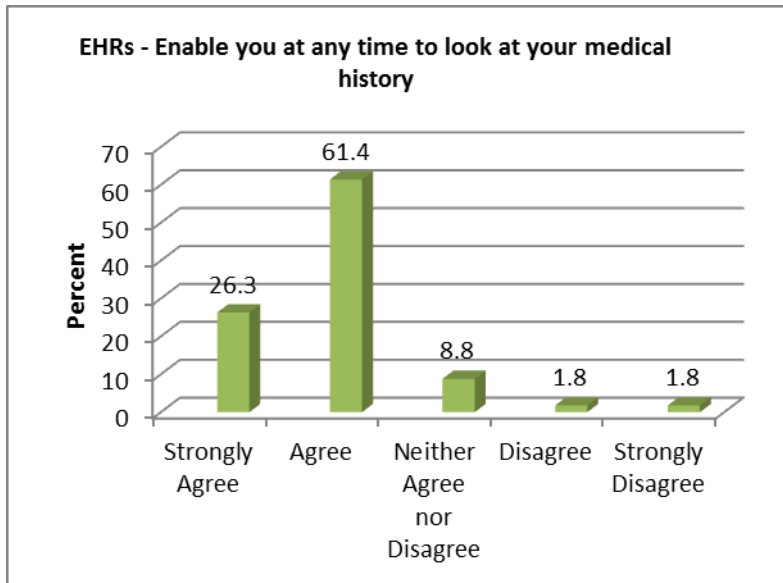


Figure 7.25: Participants' perceptions of EHR benefits - enabling participants to look at their medical history

Participants were asked if they thought EHRs enabled them to look at their current prescriptions and dosages at any time. Figure 7.26 shows that the majority of participants (89.9%) agreed or strongly agreed with this statement while a very small number of participants disagreed (1.8%) or strongly disagreed (1.2%).

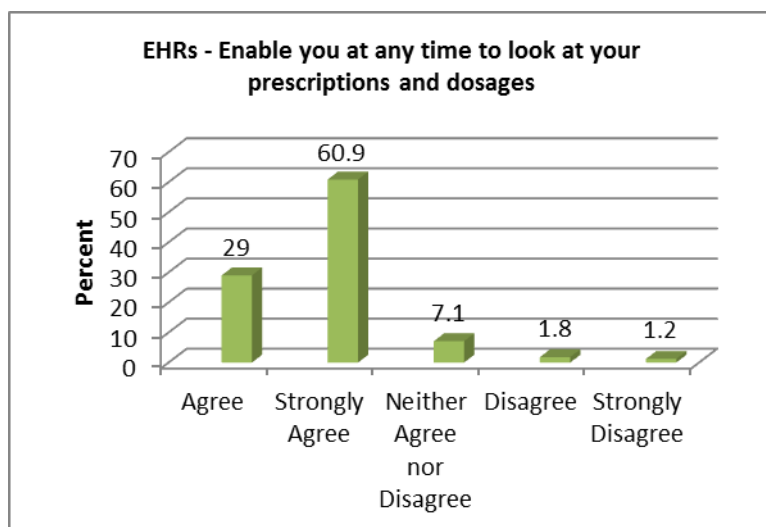


Figure 7.26: Participants' perceptions of EHR benefits – enabling participants to look at their prescriptions and dosages at any time.

Almost all participants (91.3%) supported the statement that EHRs would enable them to look at their recent medical results whenever they needed to (for example, laboratory results or X-rays) (Figure 7.27).

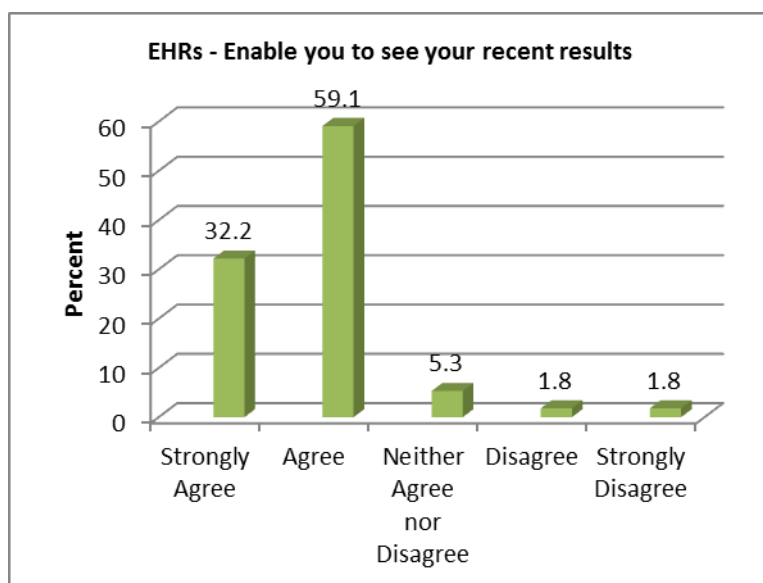


Figure 7.27: Participants' perceptions of EHR benefits – enabling respondents to see their recent medical results.

Figure 7.28 shows that nearly all respondents (91.2%) agree or strongly agree that EHRs will afford them quicker access to their test results.

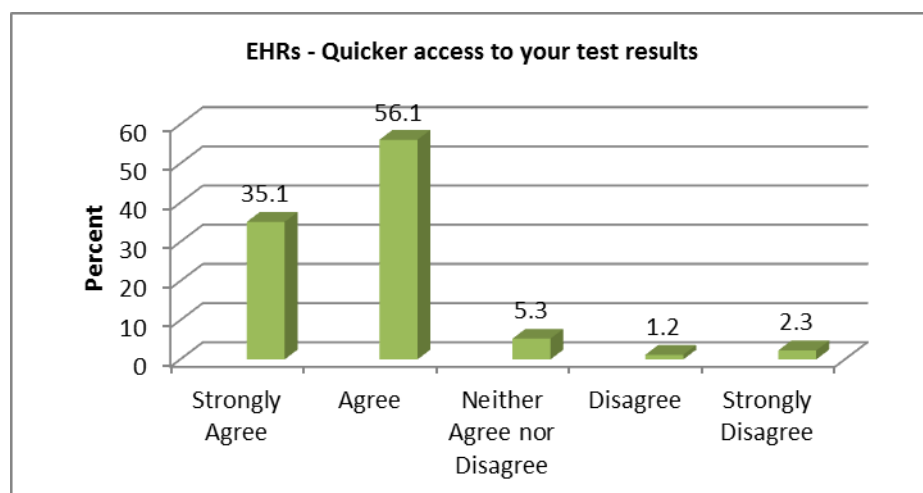


Figure 7.28: Participants' perceptions of EHRs benefits – giving participants quicker access to their test results.

Figure 7.29 shows that about three-quarters of the participants, 76.4%, agree or strongly agree that the use of EHRs may mean fewer lost records and/or test results. This result shows elevation in the frequency of participants who neither agree nor disagree at 13.9%, compared to

earlier questions about benefits. Just under 10% of respondents disagreed or strongly disagreed that EHRs would prevent record and/or test result loss.

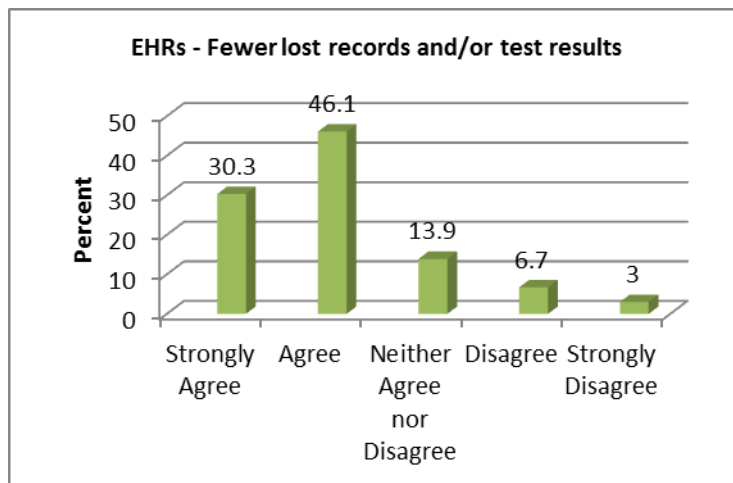


Figure 7.29: Participants' perceptions of EHR benefits – fewer lost records/or test results.

80.2% of participants responded positively about EHRs allowing them to choose who can and cannot see their medical records (Figure 7.30).

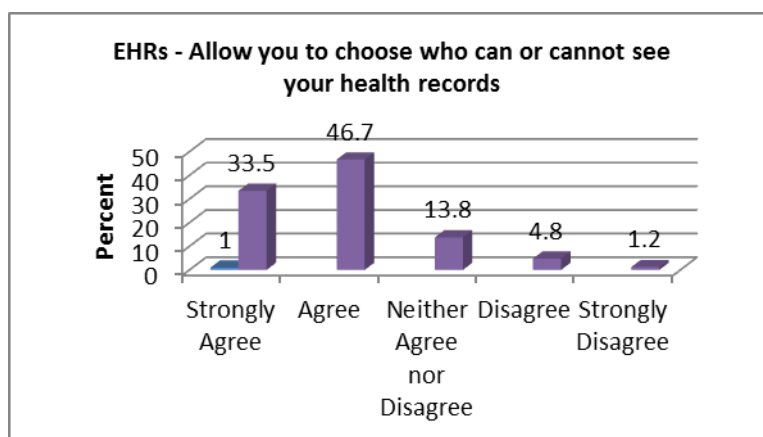


Figure 7.30: Participants' perceptions of EHR benefits – allowing people to choose who can and cannot see their medical records.

The number of participants who agreed or strongly agreed with the statement that “EHRs will allow you to make or change appointments online for GP or hospital visits” dropped to 76.4%

compared with other statements about the benefits of EHRs which were above 80%.

Participants who neither agreed nor disagreed were 18.8% (Figure 7.31).

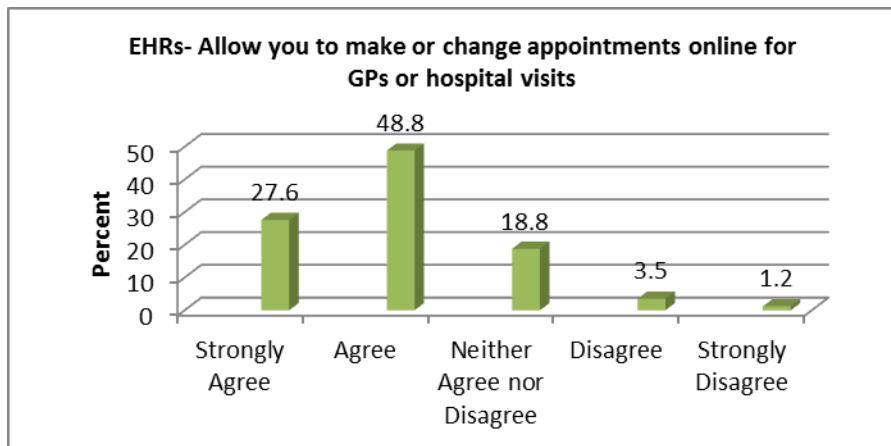


Figure 7.31: Participants' perceptions of EHR benefits – allowing consumers to change appointments online for GP or hospital visits.

Figure 7.32 shows that 72.1% of respondents strongly agree or agree that EHRs may enable people to record their wishes (for example, organ donor or life support).

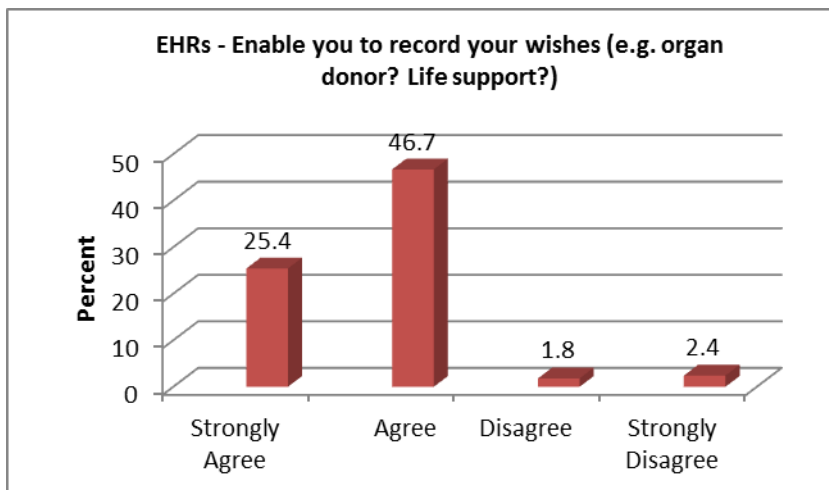


Figure 7.32: Participants' perceptions of EHR benefits – enabling participants to record their wishes.

7.1.3.5 Possible problems with Electronic Health Records (Questions 17 & 18)

Question 17 research hypothesis: When participants are given a list of negative aspects of EHRs they will all agree that EHRs might raise such concerns for them.

Participants were given a list of possible problems that EHRs may encounter and asked whether they agreed or disagreed with these. Approximately less than half of the respondents agree that electronic health records could increase medical error (46.1%). Just over a third (34.2%) neither agreed nor disagreed, almost matching the number of participants who agreed that EHRs could cause medical errors.

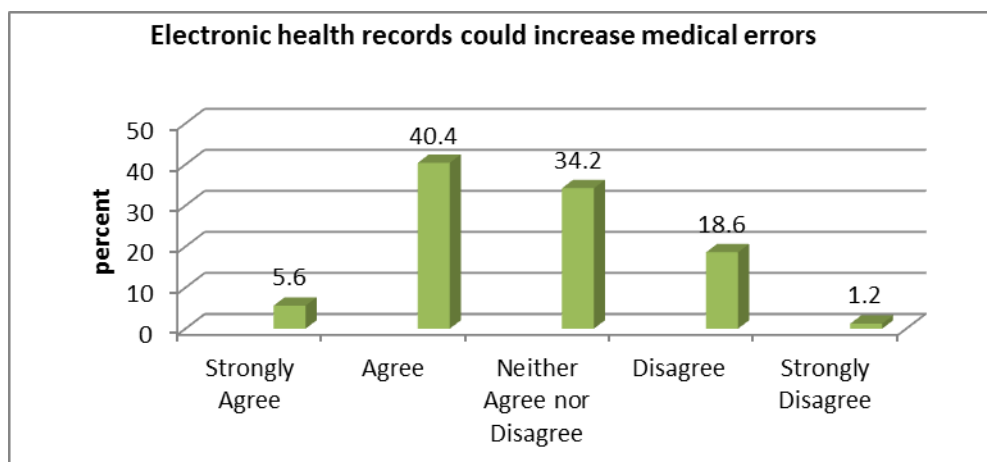


Figure 7.33: Frequency distribution of participants' perceptions that EHRs could lead to increases in medical errors.

Approximately 70% of the participants agreed ($n = 79$) or strongly agreed ($n=32$) that EHRs could lead to sensitive medical-record information leaking (Figure 7.34). This supports the hypothesis that participants perceive EHRs as potentially problematic, in accordance with the list of issues mentioned.

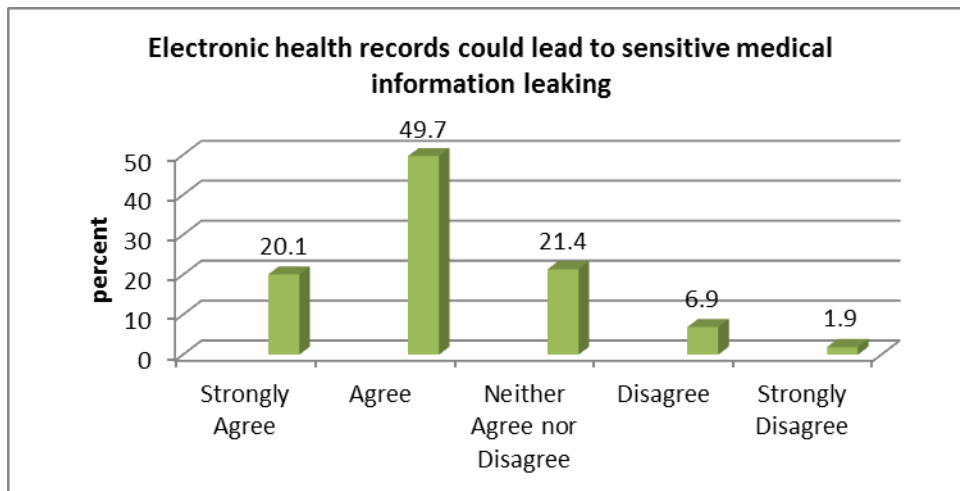


Figure 7.34: Frequency distribution of participants' perceptions of anticipated problems that EHRs could lead to – sensitive medical record information leaking.

Approximately 70% of respondents agreed that EHRs could allow sharing of their medical-record information. Of all the four proposed problems, leaking of information had the highest percentage of respondents in agreement that this was a possibility associated with EHRs. This demonstrates respondents' concern about confidentiality of their information.

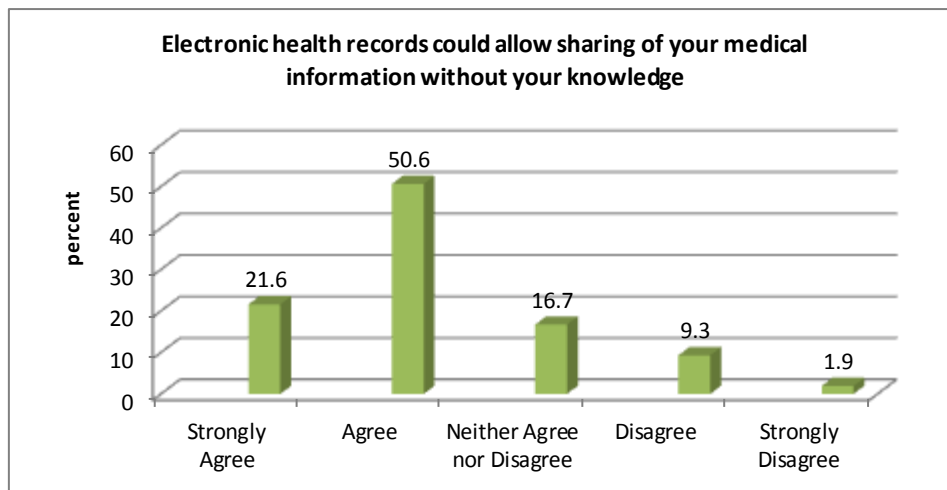


Figure 7.35: Frequency distribution of participants' perceptions of anticipated problems that EHRs could lead to – sharing of medical record information without participants' knowledge.

Two third of the participants (66.6%) strongly agree that EHRs may not entail sufficiently robust information/data security mechanisms of features. In terms of potential problems associated with EHRs, participants' agreement or strong agreement ranged between approximately 45%and 70%, significantly less than the 100% originally hypothesised.

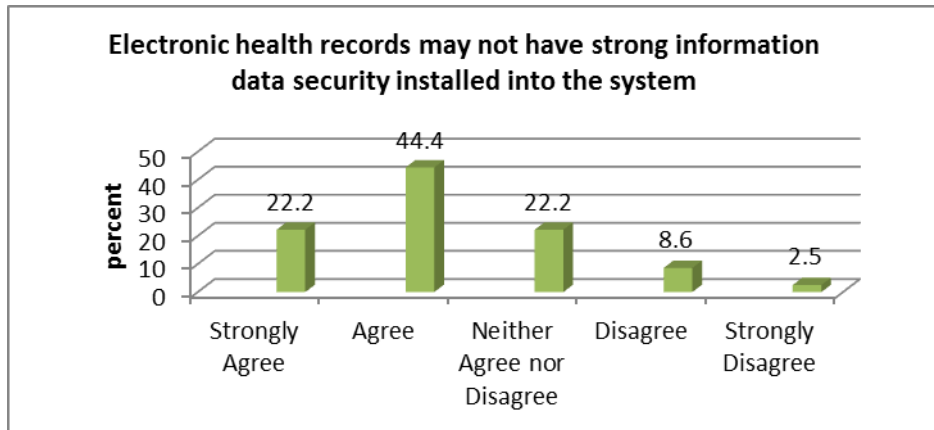


Figure 7.36: Frequency distribution of participants' perceptions regarding EHR information/data security mechanisms.

Question 18 research hypothesis: Participants will perceive electronic medical records as likely to be affected by, or vulnerable to, problems faced by online systems.

Participants were given a list of possible problems that EHRs may encounter. Just under three-quarters of respondents (73.9%) reported that they strongly agree or agree that malicious software could cause potential problems for EHR systems (Figure 7.37).

Figure 7.38 shows that 70.7% of the respondents to this question agree or strongly agree that vendor access to the EHR system would cause potential problems. Vendors include the sellers, suppliers or retailers of the Electronic Health Record system.

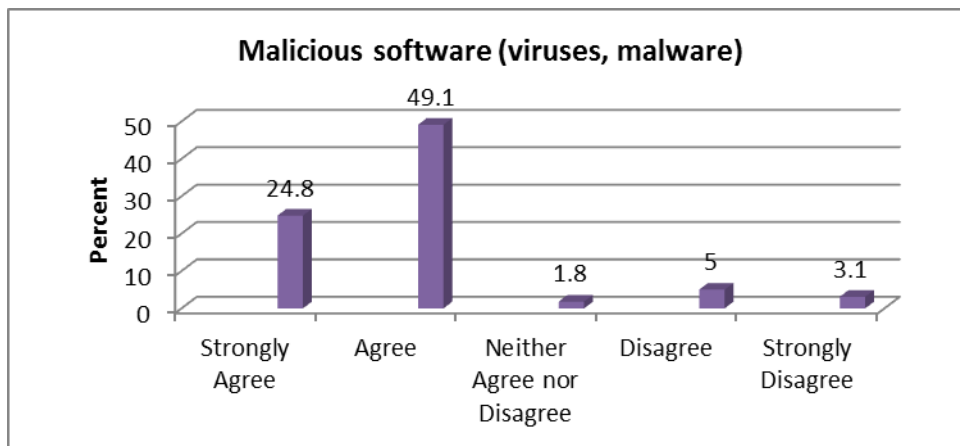


Figure 7.37: Frequency distribution of participants' perceptions regarding malicious software as a potential problem that may affect EHRs.

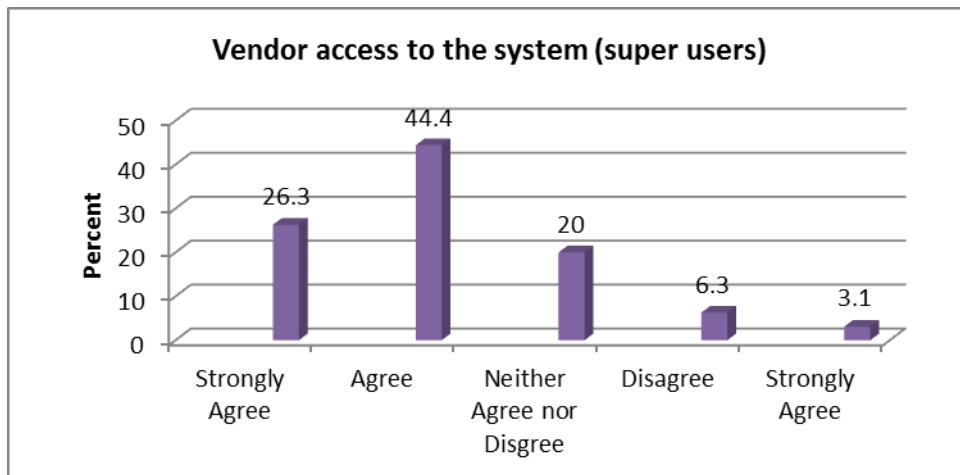


Figure 7.38: Potential problems that might affect EHRs (vendor access to the EHR system).

Approximately 61% of respondents agreed or strongly agreed that long term accessibility and storage of information held in EHRs could be a potential problem. A reasonably high number of participants (40%) were either neutral or disagreed with this statement (Figure 7.39).

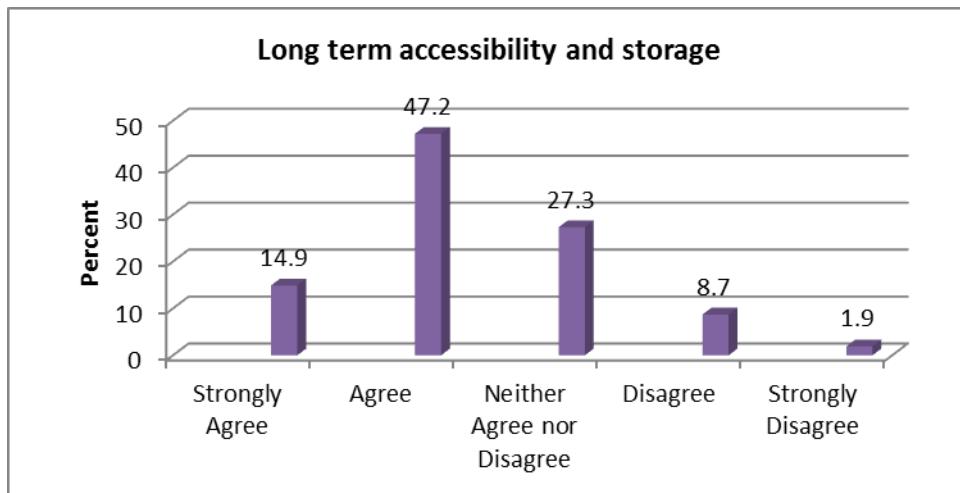


Figure 7.39: Potential problems that might affect EHRs – long term accessibility and storage of information.

Figure 7.40 shows that two-thirds of the respondents (66.7%) agreed or strongly agreed that hackers or crackers are a threat to EHRs and may cause deliberate harm to the EHR system.

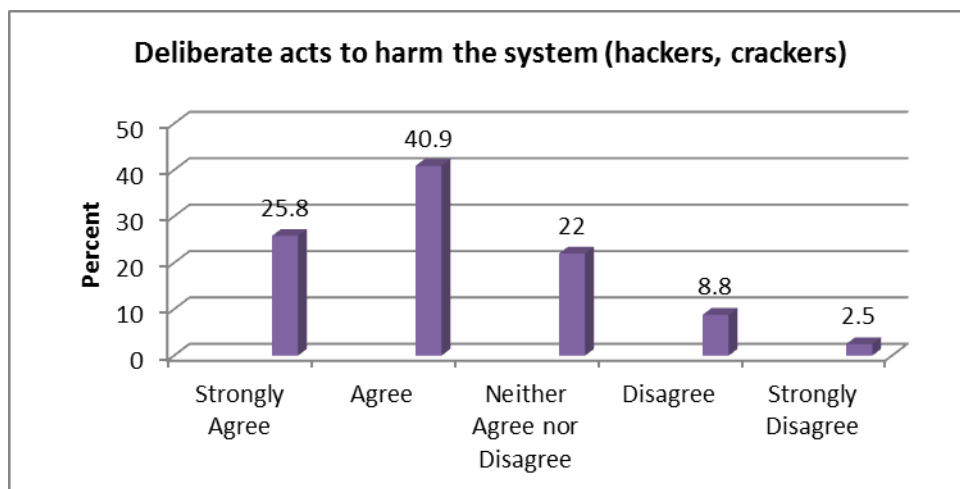


Figure 7.40: Potential problems that might affect EHRs – hackers and crackers.

62.5% of respondents strongly agreed or disagreed that failure to backup medical records could be a potential problem that might affect EHRs (Figure 7.41).

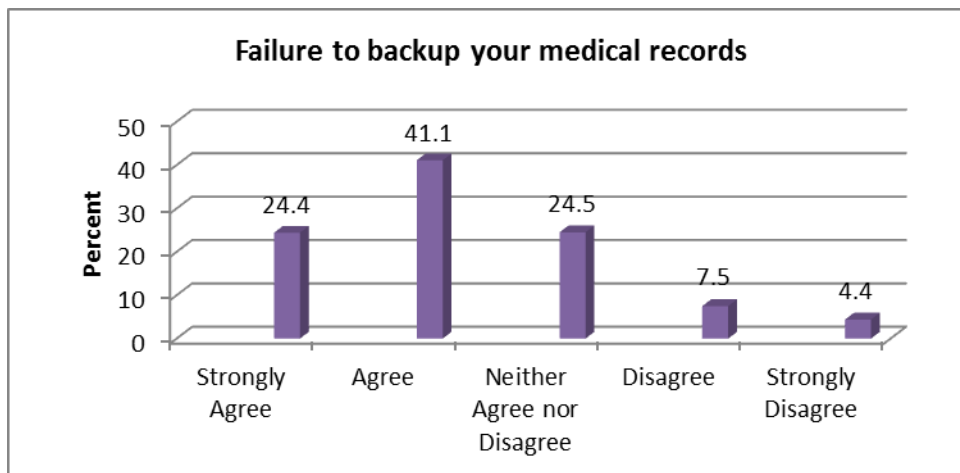


Figure 7.41: Potential problems that might affect EHRs – failure to back up medical records.

In terms of the perception of problems of online systems as an issue for EHRs, participants' agreement or strong agreement ranged between approximately 60 and 74%. These results indicate slightly higher levels of concern about these than the more 'specific' EHR problems.

7.1.3.6 Preventive security measures (Question 19)

Question 19 research hypothesis: When consumers are made aware of available security measures they will express higher levels of confidence in the security of their records. Given a list of preventive security measures, a majority of participants will agree or strongly agree that these will lead to increased EHR security.

The survey sample was asked how they would feel about the security of EHRs if some technological preventive security measures were implemented. Just over three-quarters of respondents (78.5%) strongly agreed or agreed that if anti-virus software was implemented the system will be more secure (Figure 7.42).

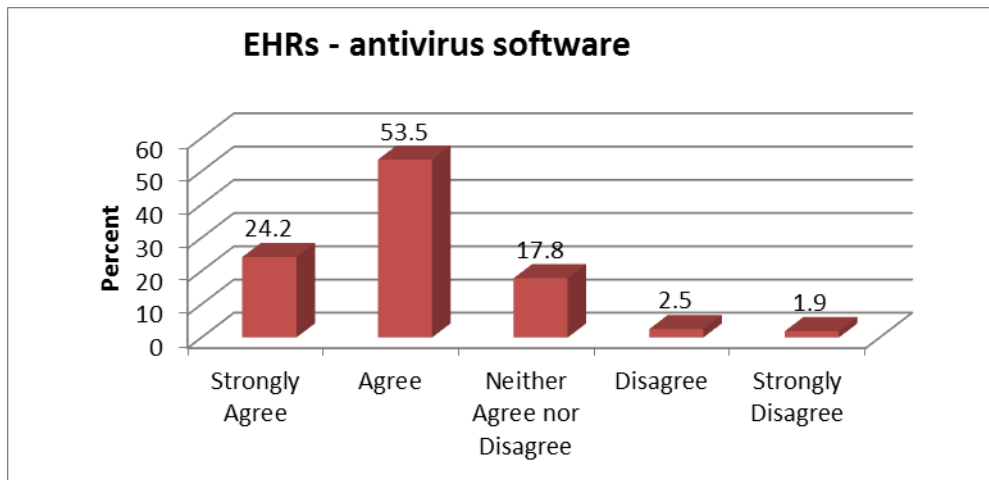


Figure 7.42: Participants' perceptions of whether preventive security measures (anti-virus software) will increase the security of EHRs.

Similarly, over three-quarters of respondents (78.5%) stated that they agreed or strongly agreed that implementing firewalls in EHRs may make the EHR system more secure (Figure 7.43).

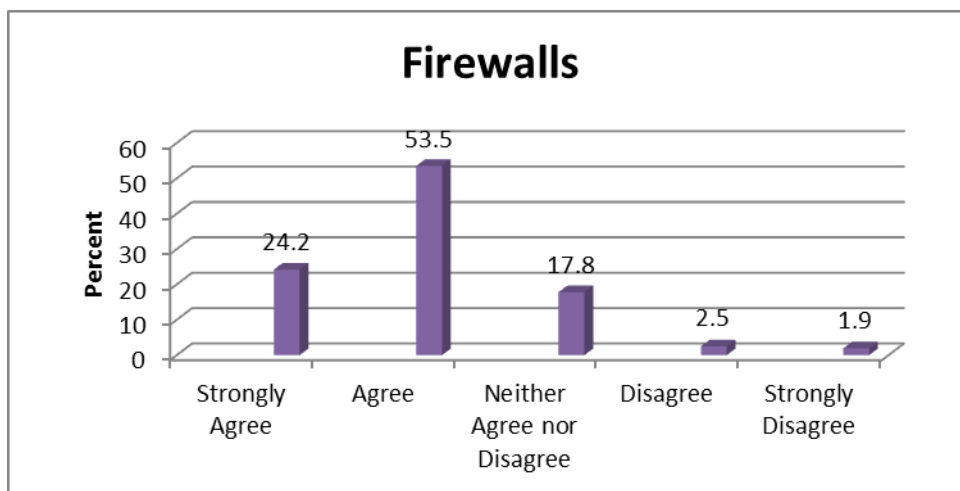


Figure 7.43: Participants' perceptions of whether preventive security measures/technology (firewall software) will increase the security of EHRs.

Nearly 80% of respondents indicated that they agreed or strongly agreed that restricted system access may make the EHR system more secure (Figure 7.44).

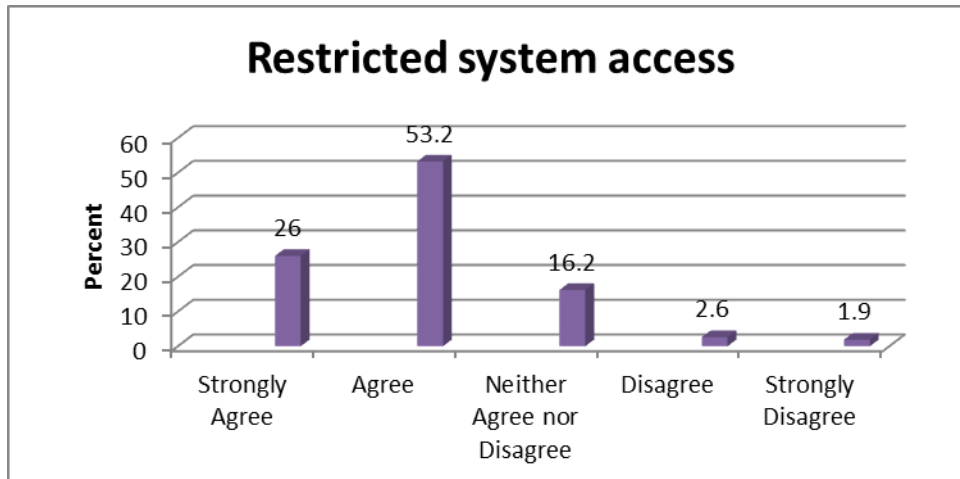


Figure 7.44: Participants' perceptions of whether preventive security measures/technology (restricted system access) will increase the security of EHRs.

More than three-quarters of respondents (77.8%) agreed or strongly agreed that implementing audit trails (so that they can see who has been doing what with their records) may make record systems more secure (Figure 7.45).

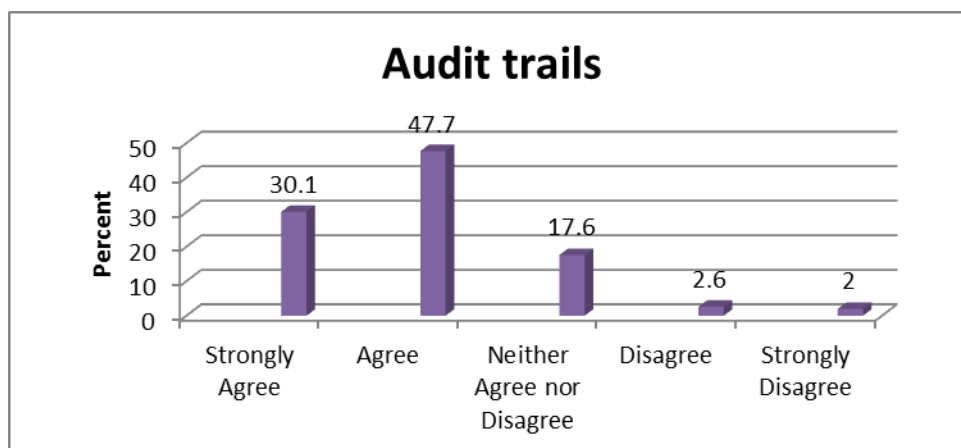


Figure 7.45: Participants' perceptions of whether preventive security measures/technology (audit trails) will increase the security of EHRs.

A similarly high proportion of respondents (78.6%) strongly agreed or agreed that encryption will increase the security of EHRs (Figure 7.46). For each of the listed security measures, more than three-quarters of respondents agreed or strongly agreed that these would increase EHR security, supporting the original research hypothesis. Furthermore, the agreement relating to security appears to be a significant increase from the non-concern about security and confidentiality reported in question 14a.

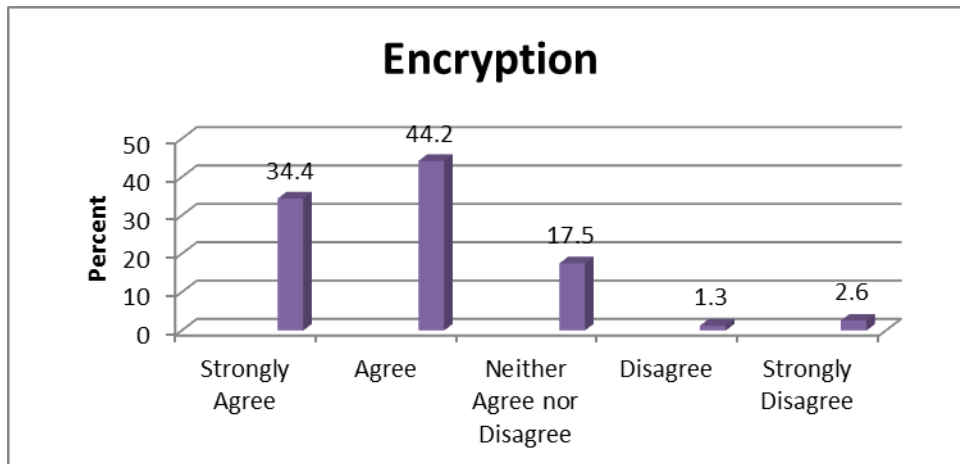


Figure 7.46: Participants' perceptions of whether preventive security measures/technology (encryption) will increase the security of EHRs.

7.1.3.7 Summary of potential benefits and problems of EHRs

The population from this study shows a general agreement that EHRs are beneficial to people's health care. The most popular benefits stated were that: EHRs would enable participants to look at their medical results whenever they needed to (for example, laboratory results, X-rays) (91.3%) (Figure 7.27); and EHRs afford quicker access to test results (91.2%). The least favoured benefit was that of enabling people to record their wishes (for example, organ donor or life support) (72.1%) which is still a relatively high proportion at almost three-quarters of respondents.

The participants still express some concern about problems that EHRs may face in regards to the security of health information. The problems they thought had the highest risks to their health information were, in ascending order; EHRs could allow sharing of your medical information without your knowledge (70%); EHRs could lead to health information leaking

(70%); vendor access to the system (70.7%); and malicious software (viruses, malware) (73.9%). The problem of least concern was that EHRs could increase medical errors (46.1%).

Respondents seem to agree that the suggested preventive technologies or measures would make EHRs more secure. There is a very small difference between the highest proportion (80%) and the lowest (77.8) – 2.2%. This may mean that respondents feel apprehensive about security of their health information and they therefore support the use of technological preventive measures. Chi-square tests will be performed to compare data according to the remaining hypotheses of the study in the following section.

7.2 Chi-square tests/cross tabulations examining associations between variables

Chi-square tests of independence were performed to examine the relationship between respondents' gender and age and their answers to questions 1 – 19 (health state and service use, computer use, perceptions of EHRs). The chi-square results and significance values are reported against the original research hypotheses, demonstrating the extent to which these are supported by survey findings. Gender and age were the primary dependent variables that were used to test statistical significance of relationships with independent variables. The groupings of age were changed in order to provide statistically significant results. The age groups became 18 to 25, 26 to 35, 36 to 45, and 56+ where the 56 to 70+ were grouped to form the 56+ years age group.

Question 1 research hypothesis: Females are more likely than men to have a health practitioner or a service that they usually go to when they are unwell.

Chi-square results examining gender and age in relation to visiting a health practitioner found no significant association with gender ($\chi^2 = 0.23$, $df = 1$, $p = 0.631$), not supporting the research hypothesis. However, there was a strong statistically significant association with age: $\chi^2 =$

20.67, $df = 4$, $p = 0.001$. In general, older participants were more likely to visit a health practitioner when feeling unwell.

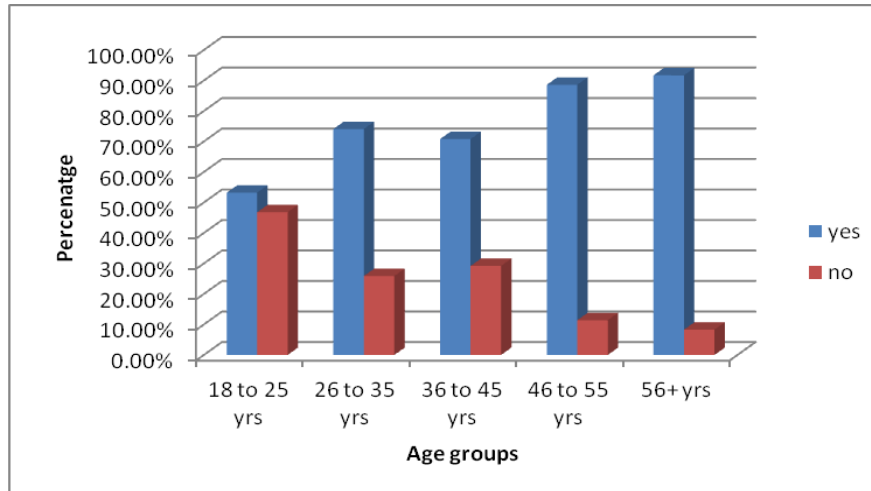


Figure 7.47: Graph illustrating whether participants have a practitioner they go to first when they feel unwell, by age group.

Question 2 and Question 3 research hypotheses: Females are more likely to have a general practitioner (GP) and more likely to have had a health practitioner carry out tests/examinations over the last twelve months than males.

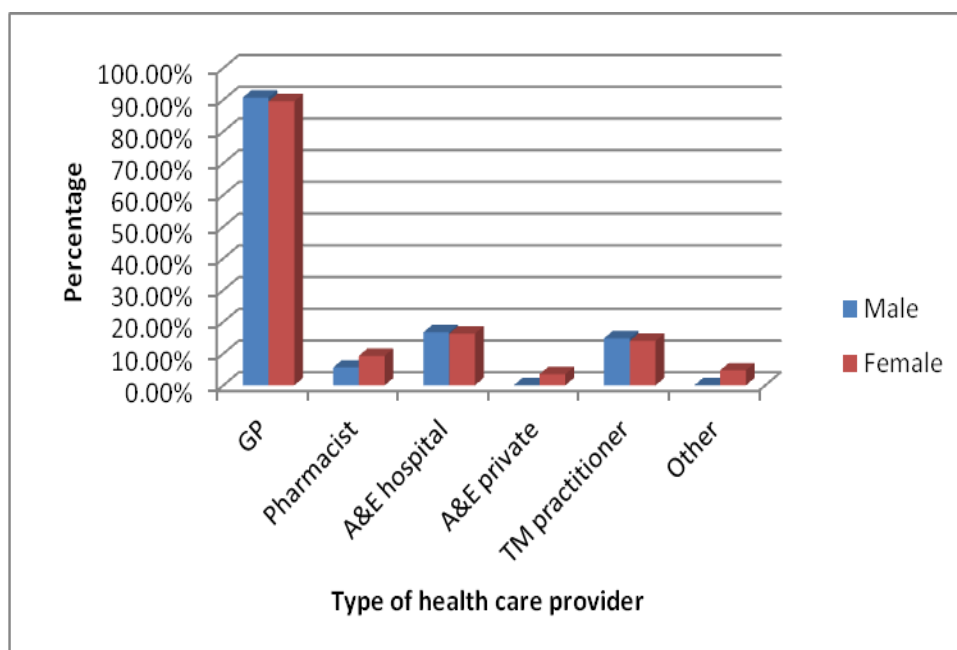


Figure 7.48: Graph illustrating type of health care provider respondents' visit when unwell, according to gender.

Figure 7.48 shows that general practitioners are considerably more likely to be consulted by respondents when they are unwell, in the first instance. However, chi-square test results yielded no association between participants' gender and choices of practitioners they first go to when they are feeling unwell: $\chi^2 = 0.231$, $df = 1$, $p = 0.631$. Figure 7.49 shows that, with the exception of diabetes tests, males received tests/examinations at higher levels than females. Conversely, males were provided with 'no/none of the above' tests at lower levels than females. However, perhaps as a result of the small number of responses, chi-square tests confirmed that these were non-significant differences according to gender ($\chi^2 = 0.09$, $df = 8$, $p > 0.05$). Thus, the research hypothesis is not supported by these findings.

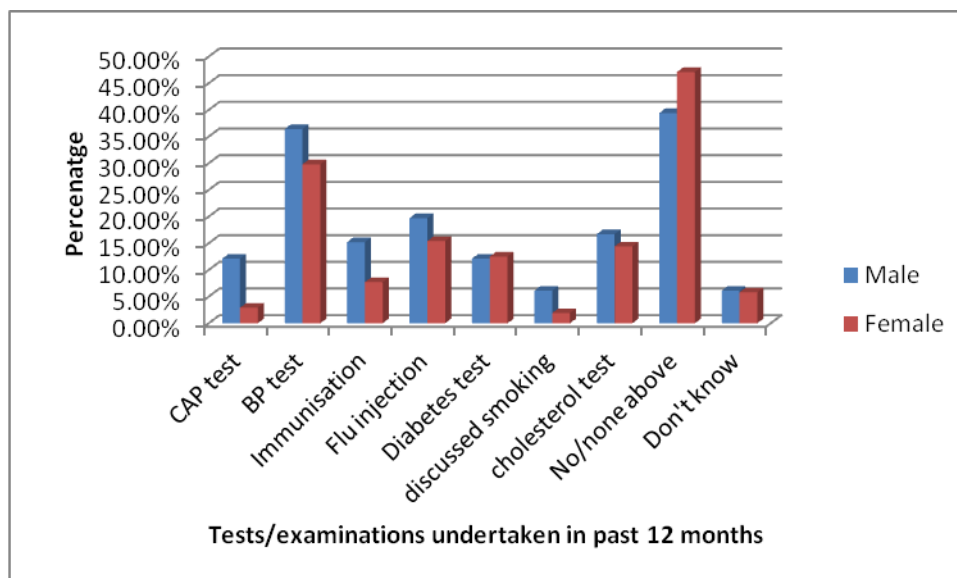


Figure 7.49: Graph illustrating test/examinations undertaken by participants in the past 12 months, by gender.

Questions 4-9 research hypothesis: Men will have higher self-reported health status compared to women.

Question 4: Mobility

Chi-square test results showed that there was no association between gender and mobility ($\chi^2 = 1.001$, $df = 1$, $p = 0.316$). However, tests results indicated that there was a significant association between the ages of participants and mobility (having problems or no problems) as shown: $\chi^2 = 44.72$, $df = 4$, $p = 0.001$. Younger participants were significantly less likely to have problems with mobility than older participants (Figure 7.50).

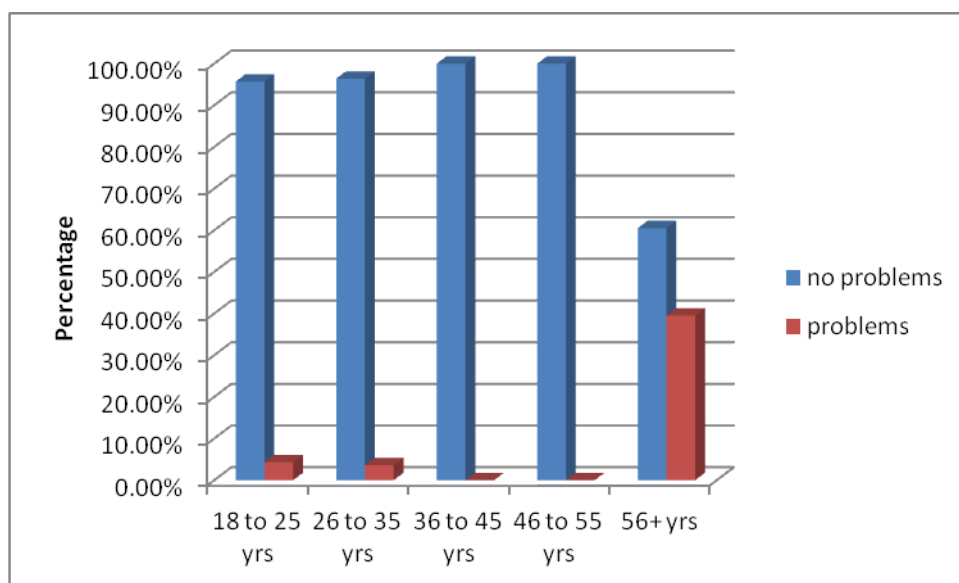


Figure 7.50: Graph illustrating participants' reported mobility, by age group.

Question 5: Self- care

The results from chi-square tests revealed that there is no association between gender and capacity for self-care: $\chi^2 = 1.31$, $df = 1$, $p = 0.252$. Results showed an association between age and capacity for self-care, as follows: $\chi^2 = 14.07$, $df = 4$, $p = 0.007$, with those aged 56+ years significantly more likely to report 'problems'.

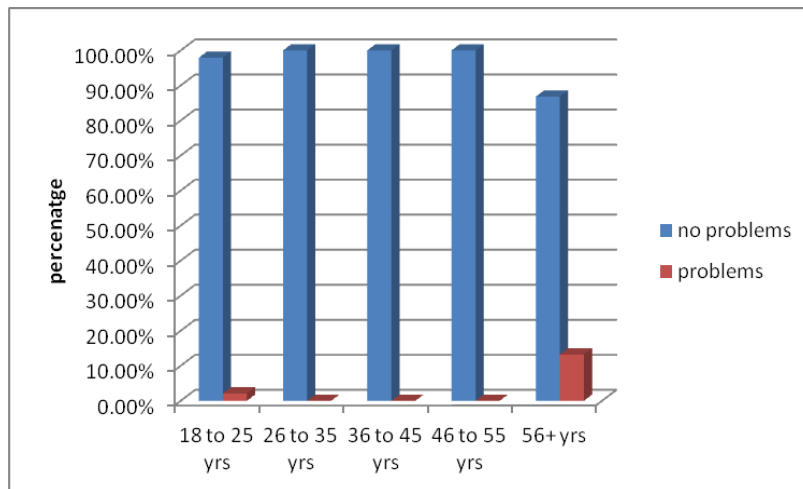


Figure 7.51: Graph illustrating participants' capacity for self-care, by age group.

Question 6: Usual activities

An association between participants' gender and reported capacity to undertake usual activities was not found, as shown: $\chi^2 = 0.88$, $df = 1$, $p = 0.35$. Similarly to earlier results, participants' age has a significant bearing on capacity for usual activities, as shown in the following value: $\chi^2 = 36.37$, $df = 4$, $p = 0.001$. Those aged 56+ years were significantly more likely to report problems in terms of capacity.

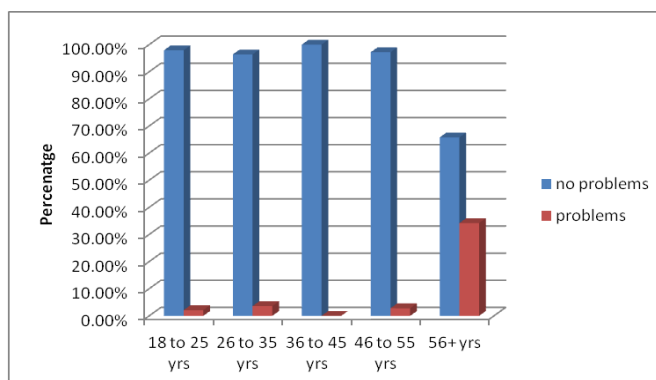


Figure 7.52: Graph illustrating participants' reported capacity to undertake usual activities (for example, work, study, house work, family or leisure activities), by age group.

Question 7: Pain/discomfort

A relationship was not found for gender, according to the chi-square test results: $\chi^2 = 0.215$, $df = 1$, $p = 0.643$. A significant association was found with age, however: $\chi^2 = 28.31$, $df = 4$, $p = 0.001$. Respondents aged 46 years and older were more likely to report problems with pain/discomfort.

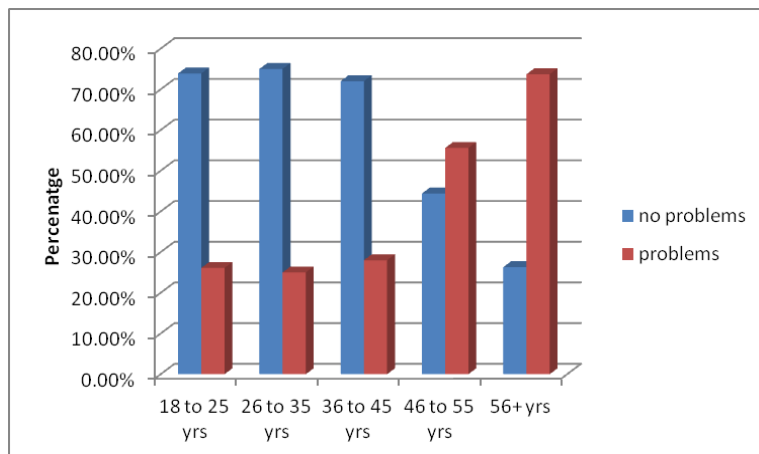


Figure 7.53: Graph illustrating participants' reported pain/discomfort, by age group.

Question 8: Anxiety/depression

An association was not found for either gender or age, in relation to participants' reports of feeling depressed or anxious, as shown respectively: $\chi^2 = 0.15$, $df = 1$, $p = 0.696$; $\chi^2 = 8.51$, $df = 6$, $p = 0.203$.

Question 9: Health state

Similarly to feelings of anxiety/depression, perceptions of health state (0 = worst health you can imagine, 100 = the best health state you can imagine) were not strongly associated with either gender or age, as shown: $\chi^2 = 30.80$, $df = 27$, $p = 0.279$; $\chi^2 = 119.77$, $df = 108$, $p = 0.207$.

It is very clear from the participant responses that the research hypothesis relating to Questions 4 – 9 is not supported. Gender is not a significant variable in how respondents perceive and report their health status, i.e. there are no significant differences in reported health status between male and female respondents. Age however, is very clearly a significant variable – in general older respondents report poorer health. The implications of this key finding will be discussed in Chapter 8.

Questions 10 – 12 research hypotheses:

- a) Both males and females will utilise complementary and alternative medicine;
- b) Age will have effect on the utilisation of CAM. Persons aged ≤ 46 years will use CAM more than persons aged ≥ 46 years.

Q10: CAM use

Chi-square tests were performed to test the null hypotheses of no association between participants' gender, age and having seen a CAM worker or a traditional healer in the last 12 months. Significant associations for both gender and age were found, respectively: $\chi^2 = 19.49$, $df = 8$, $p = 0.012$; $\chi^2 = 18.12$, $df = 8$, $p = 0.020$. (see Figures 7.54 & 7.55).

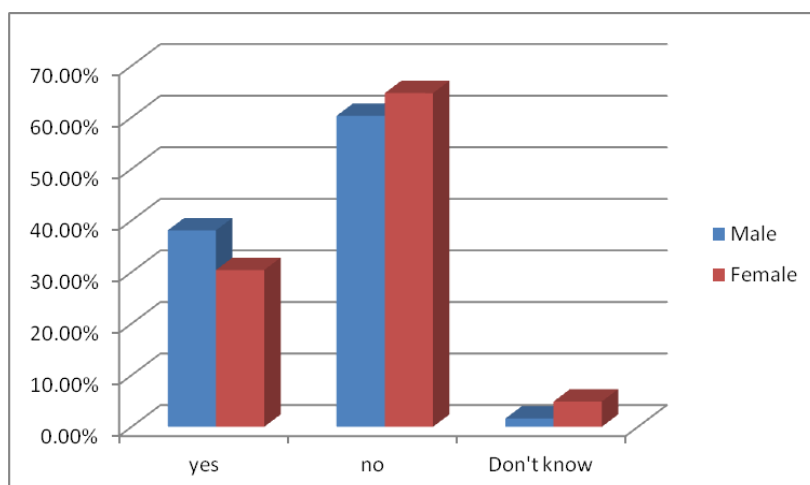


Figure 7.54: Participants' CAM use in the last 12 months, by gender.

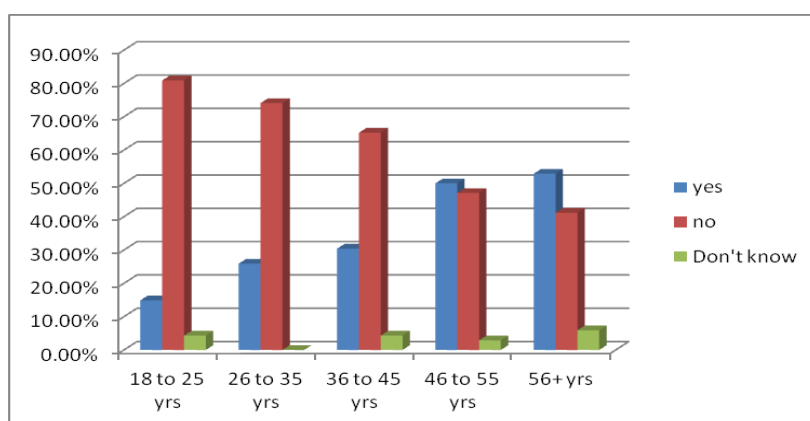


Figure 7.55: Participants' CAM use in the last 12 months, by age group.

Research hypothesis a) Both men and women did utilise CAM, but there was a significant difference – Figure 7.55 indicates that female respondents were significantly less likely to use CAM than their male counterparts.

Research hypothesis b) Contrary to the hypothesis, older respondents were significantly more likely to report use of CAM, and younger respondents were less likely.

Questions 13 to 19: Electronic Health Records – patients’ health information held only in electronic form

Question 13 research hypothesis: Use of computers will affect the views of participants in having their personal health information stored in electronic records. More specifically, people who buy goods or services on the internet are more likely to have greater awareness of internet security protocols than those who use the internet less often or not for this purpose.

Question 13: Computer use

A significant association was found between age and computer use, as shown: $\chi^2 = 74.28$, $df = 16$, $p = 0.001$ (Figure 7.56). It appears that there is a general trend of declining ‘regular’ computer use, the older respondents are. An interesting result is that computer use appears to be most limited overall among respondents aged 36 to 45 years. An association was not found for gender: $\chi^2 = 2.55$, $df = 4$, $p = 0.635$.

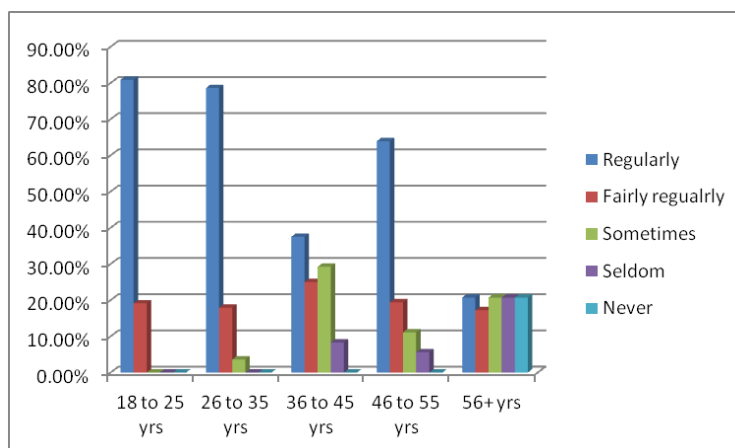


Figure 7.56: Participants’ reported computer use, by age.

Question 13: E-mail use

Chi-square tests yielded a significant association of e-mail use with age: $\chi^2 = 29.93$, $df = 16$, $p = 0.018$. Respondents aged 56+ years appear less likely to use e-mail. No association was found for gender, as demonstrated: $\chi^2 = 1.52$, $df = 4$, $p = 0.823$.

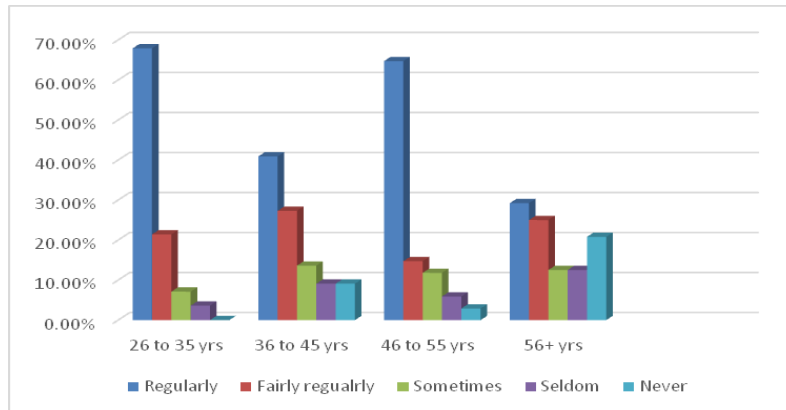


Figure 7.57: Participants' reported e-mail use, by age.

Question 13: Internet use

Again, age was found to be significantly associated with internet use: $\chi^2 = 44.14$, $df = 16$, $p = 0.001$. A general trend of declining 'regular' internet use is observed across age groups in Figure 7.58. No association was found in relation to gender, as demonstrated: $\chi^2 = 4.94$, $df = 4$, $p = 0.293$.

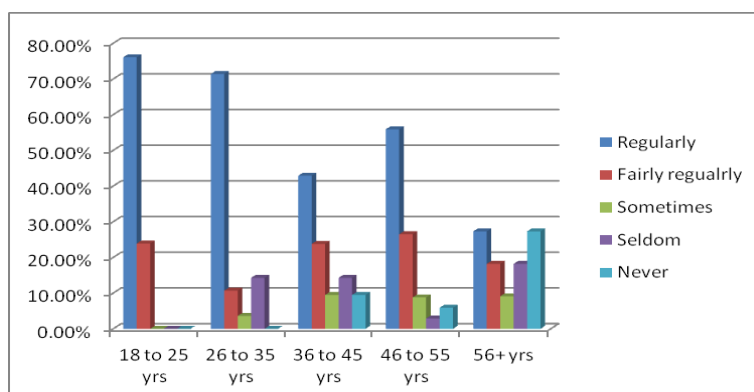


Figure 7.58: participants' Internet use, by age.

Question 13: Internet purchases

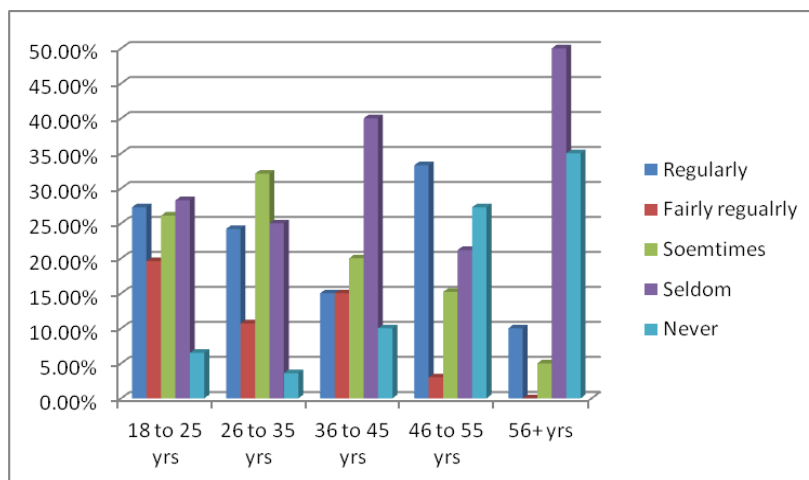


Figure 7.59: Participants' Internet use to make purchases, by age.

Examining the relationship between participants' age, gender, and their use of the internet to purchase goods or services, an association was found for age ($\chi^2 = 34.99$, $df = 16$, $p = 0.004$) but not gender ($\chi^2 = 8.18$, $df = 4$, $p = 0.085$). With the exception of the 46 to 55 year age group (who report 'regular' internet purchases in the highest number), younger respondents report more regular use of the internet to make purchases, and those aged 56+ years make purchases significantly less frequently.

This section's results shows the significance of age in relation to computer use overall; younger respondents aged 18 to 35 years are significantly more likely to use computers regularly for email, internet and buying goods than older respondents.

Question 14: Security and confidentiality of medical records

Question 14 (a) research hypothesis: Many health consumers will be concerned about security of and confidentiality of their health information.

Question 14 (b) research hypothesis: Although it is estimated that 95% of New Zealand health consumers have a national health index number (NHI), most people will not understand what the NHI is or what their own NHI number is.

Participants' age and gender were not found to be significantly associated with their concerns about security and confidentiality of personal health information, as shown respectively: $\chi^2 = 13.55$, $df = 12$, $p = 0.330$; $\chi^2 = 4.78$, $df = 3$, $p = 0.189$. Of all the respondents in the descriptive analyses, 42.2% said that they were concerned and 44.7% indicated that they were not concerned about confidentiality of their information.

Internet purchases (Question 13) and security and confidentiality of medical records (Question 14) cross-tabulation

The (Q13) hypothesis that people who buy goods or services on the internet are more likely to have greater awareness of internet security protocols than those who use the internet less often was tested using a chi-square test. The results yielded a statistically significant relationship: $\chi^2 = 15.69$, $df = 8$, $p = 0.047$. In general, levels of 'no concern' relating to confidentiality increase with the frequency of respondents' internet buying habits, i.e. those who seldom make purchases on the internet report the highest levels of no concern, while those who purchase 'regularly' or 'fairly regularly' report the lowest levels of no concern. The pattern for reported concern is less clear however; those who make regular internet purchases reported that they were concerned with confidentiality at the same levels as those who 'seldom' purchase goods or services on the internet (Figure 7.60). Those participants who were 'not sure' were spread across all the categories but higher in the 'regularly', 'sometimes' and 'never' responses.

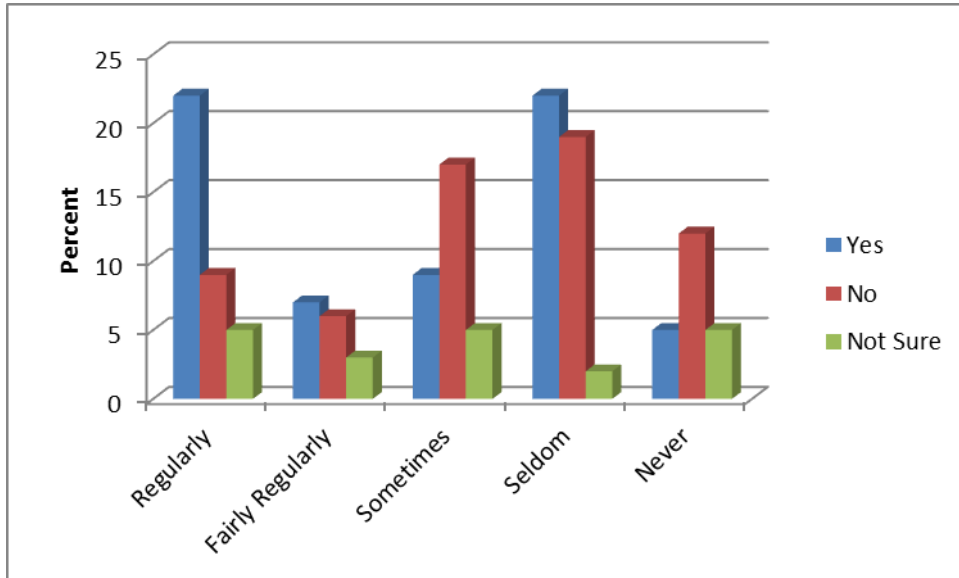


Figure 7.60: Participants' buying habits on the internet and concern regarding confidentiality of their medical records.

Question 14: Knowledge of the National Health Index

Similarly to the earlier question, participants' age and gender were not found to be significantly associated with knowledge of the National Health Index: $\chi^2 = 8.19$, $df = 8$, $p = 0.415$; $\chi^2 = 2.37$, $df = 2$, $p = 0.305$.

Question 15: Awareness of Electronic Health Records

Chi-square tests found no association between participants' age and their knowledge of EHRs: $\chi^2 = 6.75$, $df = 4$, $p = 0.150$. There was, however, a significant association with gender, as shown: $\chi^2 = 4.21$, $df = 1$, $p = 0.040$. Females were more aware of EHRs than males (Figure 7.61).

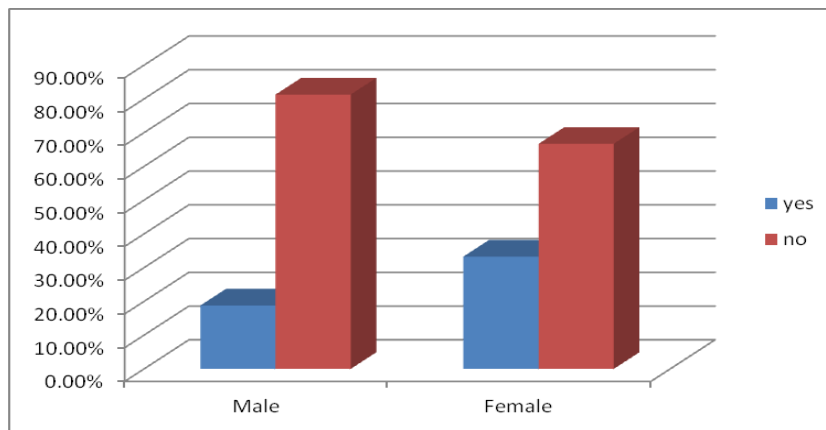


Figure 7.61: Participants' knowledge of EHRs, by gender.

The hypothesis for Question 15 (awareness of EHRs, see section 7.1) was also tested for relationship with health states. No statistically significant relationship with any of the self-rated health states was found. This may be because respondents generally reported good health, and therefore may have little concern with or knowledge about medical records. The chi-square results were as follows:

- Question 4, mobility: $\chi^2 = 6.78$, $df = 3$, $p = 0.079$;
- Question 5, self-care: $\chi^2 = 7.50$, $df = 3$, $p = 0.058$;
- Question 6, usual activities: $\chi^2 = 2.75$, $df = 3$, $p = 0.432$;
- Question 7, pain/discomfort: $\chi^2 = 2.92$, $df = 3$, $p = 0.404$;
- Question 8, anxiety/ depression: $\chi^2 = 2.92$, $df = 3$, $p = 0.079$; and
- Question 9, health states; $\chi^2 = 42.64$, $df = 31$, $p = 0.080$.

Question 16: Perceived EHR benefits

– Giving participants access whenever decisions need to be made about treatment

Chi-square tests found no significant associations between age or gender and participants' agreement or not that EHRs enable them access to their health information whenever they need to make decisions about their treatment, as shown respectively: $\chi^2 = 18.06$, $df = 16$, $p = 0.320$; $\chi^2 = 3.03$, $df = 4$, $p = 0.553$.

– Giving health practitioners after-hours access to health records to make treatment decisions

No association was found for either age or gender, as demonstrated respectively: $\chi^2 = 18.75$, $df = 16$, $p = 0.282$; $\chi^2 = 5.54$, $df = 4$, $p = 0.236$.

– Enabling individuals to look at medical history at any time

An association was not found for age: $\chi^2 = 23.06$, $df = 16$, $p = 0.112$. Nor was any significant association found for gender, as shown: $\chi^2 = 4.09$, $df = 4$, $p = 0.395$.

– Enabling individuals to look at current prescriptions and dosages at any time

Neither were age and gender significantly related to participants' perceptions of EHRs as enabling them to look at current prescriptions and dosages at any time: $\chi^2 = 23.65$, $df = 16$, $p = 0.097$; $\chi^2 = 3.20$, $df = 4$, $p = 0.525$.

– Enabling individuals to see recent test results

Age was found to be significantly associated with participants' perceptions of EHRs as beneficial in terms of enabling participants to see their recent results: $\chi^2 = 34.33$, $df = 16$, $p = 0.005$ (see Figure 7.62). A significantly greater proportion of those aged 56+ years of age

agreed that this was a benefit. No significant association was found in terms of gender: $\chi^2 = 3.07$, $df = 4$, $p = 0.547$.

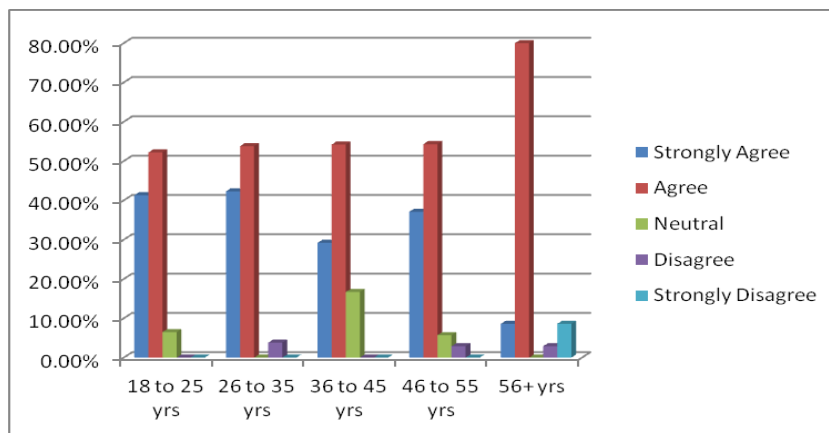


Figure 7.62: Participants' perceptions of EHR benefits - enabling participants to see their recent results, by age.

– Quicker access to test results

Chi-square tests found that age was significantly associated with participants' perceptions that EHRs enable quicker access to test results: $\chi^2 = 28.19$, $df = 16$, $p = 0.030$. Similarly to the previous benefit, those aged 56+ years reported much higher levels of agreement than other respondents. An association for gender was not found: $\chi^2 = 0.58$, $df = 4$, $p = 0.965$.

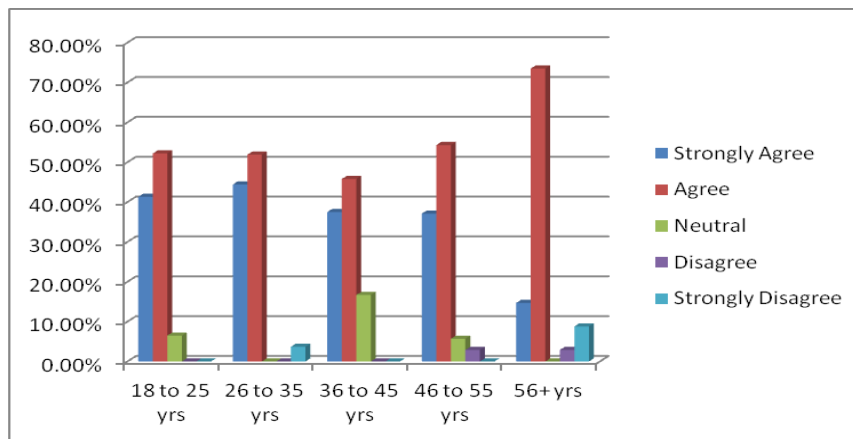


Figure 7.63: Participants' perceptions of EHR benefits - enabling participants quicker access to test results, by age.

– Fewer lost records and/or test results

Participants' age was found to be significantly related to participants' perceptions of EHRs as beneficial in terms of supporting fewer lost records and/or test results ($\chi^2 = 50.41$, $df = 16$, $p = 0.001$). Strong agreement peaks in the 26 to 35 year age group and thereafter declines across the age groups. A similar trend is shown for agreement, although the 56+ year age group reports the highest levels. An association was not found for gender: $\chi^2 = 1.06$, $df = 4$, $p = 0.901$.

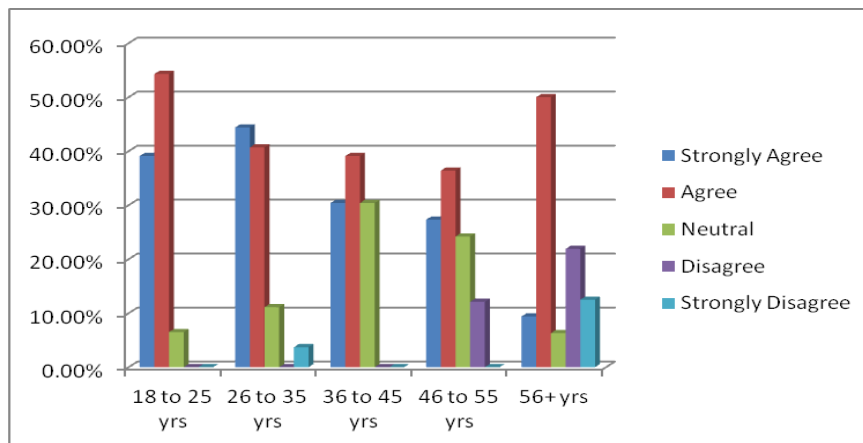


Figure 7.64: Participants' perceptions of EHR benefits – supporting fewer lost records and/or test results, by age.

– Allowing individual choice as to who can and cannot see health records

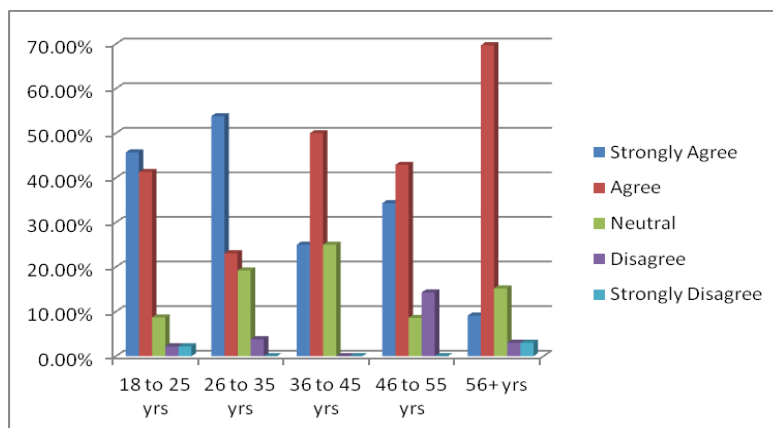


Figure 7.65: Participants' perceptions of EHR benefit in terms of choice about who can and cannot see health records, by age.

An association was found between participants' perceptions of EHRs as beneficial in terms of allowing choice about who can and cannot see health records and age, as shown: $\chi^2 = 33.85$, $df = 16$, $p = 0.006$ (Figure 7.65). Highest levels of strong agreement were reported by respondents aged 18 – 35 years, but the highest level of agreement was reported by those in the 56+ year age group. An association for gender was not found: $\chi^2 = 4.00$, $df = 4$, $p = 0.406$.

– **Allowing individuals to make or change appointments online for GP or hospital visits**

Following the pattern of the previous benefits, age was found to be significantly associated with participants' perceptions of EHRs as beneficial in terms of allowing GP or hospital appointments to be made or changed online: $\chi^2 = 27.76$, $df = 16$, $p = 0.019$ (Figure 7.66).

Respondents aged 26-35 years reported the highest levels of strong agreement with this benefit.

No association was found in relation to gender, as shown: $\chi^2 = 4.82$, $df = 4$, $p = 0.306$.

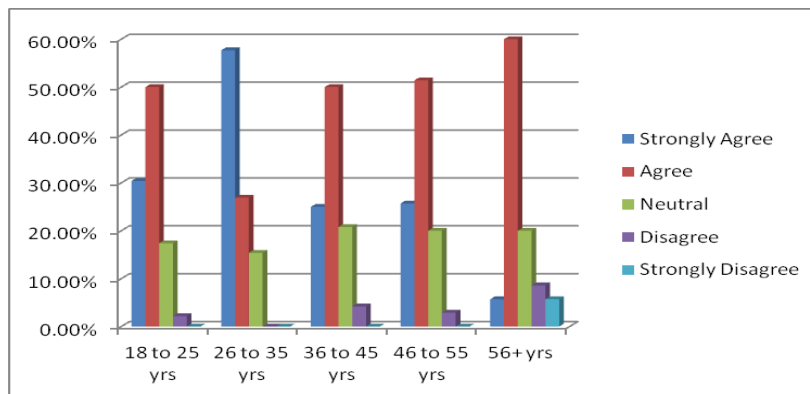


Figure 7.66: Participants' perceptions of EHRs as beneficial in terms of allowing GP or hospital appointments to be made or changed online, by age.

- **Enabling recording of individual wishes (e.g. organ donation, life support)**

Chi-square tests results found an association for age ($\chi^2 = 30.47$, $df = 16$, $p = 0.016$), but not for gender ($\chi^2 = 0.459$, $df = 4$, $p = 0.997$). Strong agreement declines over the age groups, agreement follows a general increase, and neutrality peaks in the middle age group (36 to 45 years).

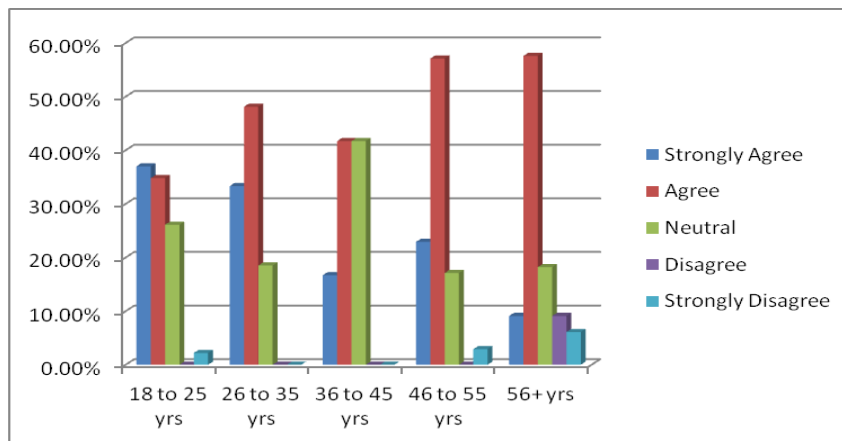


Figure 7.67: Participants' perceptions of EHR benefits – enabling individuals to record their wishes, by age.

Question 17: Anticipated problems with EHRs

Question 17 hypothesis: when participants are given a list of negative aspects of EHRs they will all agree that EHRs might raise such concerns for them.

– Increasing medical errors

Chi-square tests yielded no significant association with participants' age or gender, as shown respectively: $\chi^2 = 14.31$, $df = 16$, $p = 0.576$; $\chi^2 = 3.36$, $df = 4$, $p = 0.499$.

– Leaking of sensitive medical-record information

Participants' age was found to be significantly associated with participants' perceptions that EHRs might leak sensitive medical-record information: $\chi^2 = 28.72$, $df = 16$, $p = 0.026$. Higher proportions of those aged between 18 and 35 years agreed with this potential problem. Gender was not significantly associated: $\chi^2 = 6.33$, $df = 4$, $p = 0.176$.

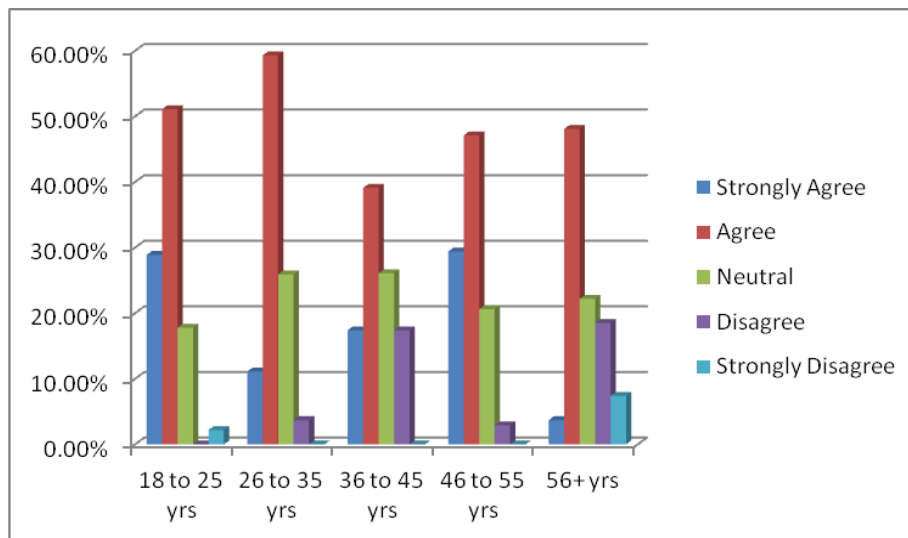


Figure 7.68: Participants' perceptions that EHRs could lead to leaking of sensitive medical-record information, by age.

– Sharing consumers' medical information without their knowledge

Chi-square tests did not find any significant associations with age or gender in terms of participants' perceptions that EHRs potentially allow sharing of medical information without consumers' knowledge: $\chi^2 = 19.72$, $df = 16$, $p = 0.233$; $\chi^2 = 7.62$, $df = 4$, $p = 0.106$.

– Insufficiently robust data security

Age was significantly associated with participants' perceptions that EHR data security may be insufficient: $\chi^2 = 28.38$, $df = 16$, $p = 0.021$. Younger respondents (aged 18-35 years) were in greater agreement. Gender was not found to be significantly associated: $\chi^2 = 5.09$, $df = 4$, $p = 0.278$.

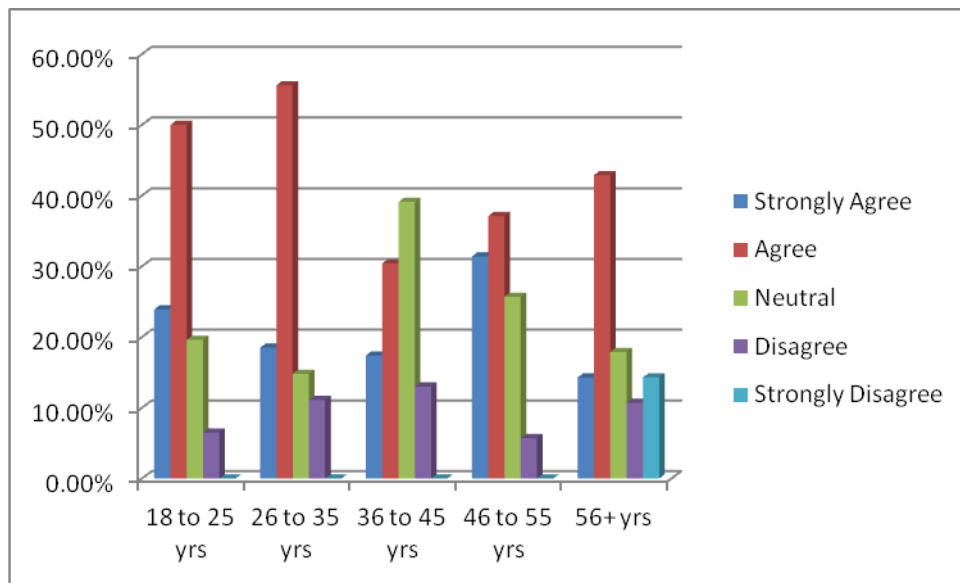


Figure 7.69: Participants' perceptions that EHR data security may not be strong enough, by age.

Question 18: Problems of online systems shared with EHRs

Question 18: hypothesis: participants are likely to believe that their medical records would be affected by the problems of online systems shared with EHRs.

– Malicious software (viruses, spyware)

Chi-square test results did not find any significant associations between participants' age, gender, and their perceptions of malicious software as a problem for EHRs as well as online systems: $\chi^2 = 24.76$, $df = 16$, $p = 0.074$; $\chi^2 = 8.26$, $df = 4$, $p = 0.083$.

- Vendor access to the system (super users)

Chi-square test results found a significant association between participants' age and their perceptions of EHRs as allowing vendor access to the system (super users): $\chi^2 = 27.47$, $df = 16$, $p = 0.037$. Strong disagreement was expressed by a greater number of respondents' aged

56+ years, and higher proportions of younger respondents agreed and strongly agreed with this potential risk. There was no association with gender: $\chi^2 = 6.87$, $df = 4$, $p = 0.143$.

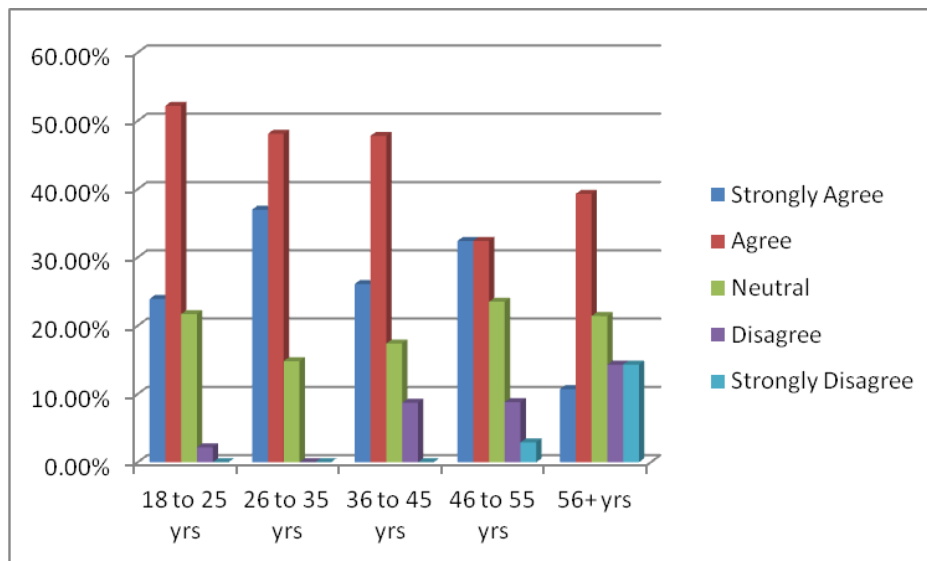


Figure 7.70: Participants' perceptions of EHRs as enabling vendor access to the system (super users), by age.

- Long-term accessibility and storage of information

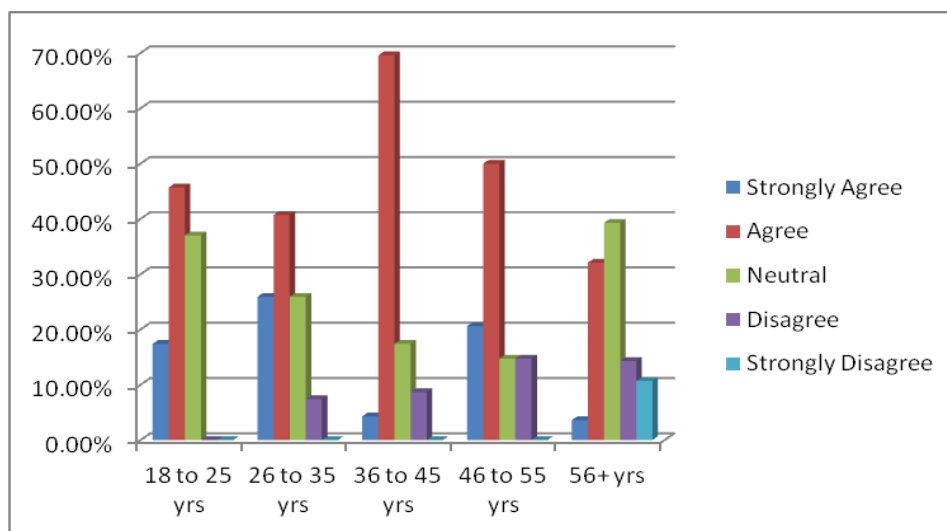


Figure 7.71: Participants' perceptions of long-term accessibility and storage of information as a problem for EHRs, by age.

Participants' age was found to be significantly associated with their perceptions of long-term accessibility and storage as a problem for EHRs ($\chi^2 = 37.70$, $df = 16$, $p = 0.002$), but not gender ($\chi^2 = 4.33$, $df = 4$, $p = 0.363$). There appears to be stronger agreement among younger respondents regarding potential risk, and higher levels of neutrality or strong disagreement among older respondents (aged 56+ years).

- Deliberate acts to harm the system (hackers, crackers)

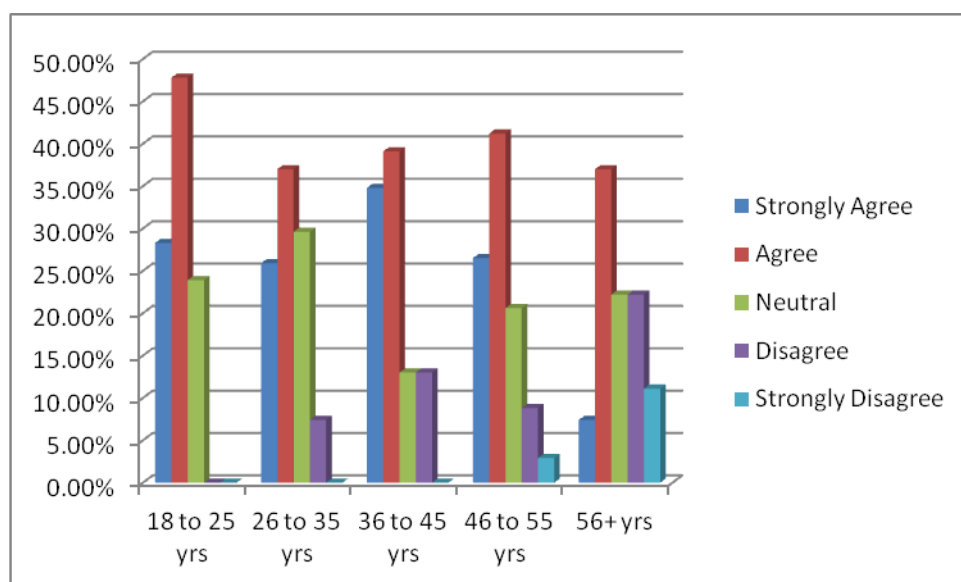


Figure 7.72: Participants' perceptions that EHRs are vulnerable to deliberate acts of harm, by age.

Participants' age was significantly associated with their perceptions that EHRs are vulnerable to deliberate acts of harm, as shown: $\chi^2 = 27.06$, $df = 16$, $p = 0.041$. Participants in the age group 18 to 25 years have the highest level of agreement with the statement that EHRs are vulnerable to 'hackers and crackers'. The 36 to 45 year age group ranked highest in the 'strongly agree' category, and those aged 26 to 35 years gave the highest number of neutral responses. An association was not found in relation to gender: $\chi^2 = 9.11$, $df = 4$, $p = 0.058$.

– Failure to backup medical records

Nor age or gender was found to be significantly associated with participants' perceptions of failure to back up records as an issue for EHRs, as shown respectively: $\chi^2 = 19.19$, $df = 16$, $p = 0.259$; $\chi^2 = 2.23$, $df = 4$, $p = 0.693$.

Question 19: Measures to increase EHR security

- Anti-virus software

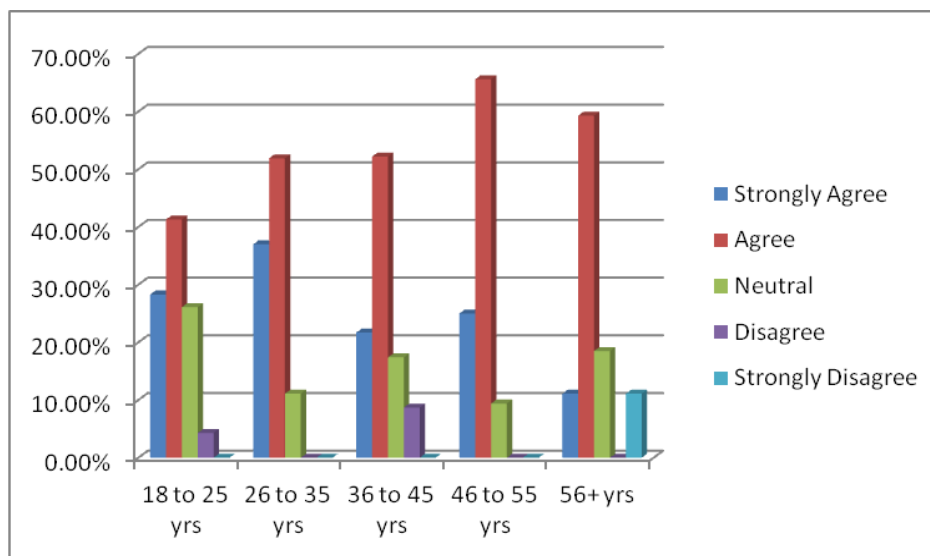


Figure 7.73: Participants' perceptions of anti-virus software as increasing EHR security, by age.

Chi-square test results show an association between age and participants' perceptions regarding the effectiveness of anti-virus software in increasing EHR security ($\chi^2 = 30.42$, $df = 16$, $p = 0.016$), but not for gender ($\chi^2 = 3.23$, $df = 4$, $p = 0.521$). Older respondents (46 to 55 years followed by the 56+ years age group) were more likely than younger respondents to agree that anti-virus software would increase the security of their medical records. The 26 to 35 year age group had the highest level of strong agreement and those aged 18 to 25 years were highest in neutrality.

– Firewalls

Similarly to the previous question, participants' age was found to be significantly associated with participants' perceptions: $\chi^2 = 31.48$, $df = 16$, $p = 0.012$. Those aged 46 to 55 years ranked highest in agreement followed by the 56+ years age group. The 26 to 35 years age group is highest in terms of neutral responses. No association was found with gender, as demonstrated: $\chi^2 = 5.76$, $df = 4$, $p = 0.217$.

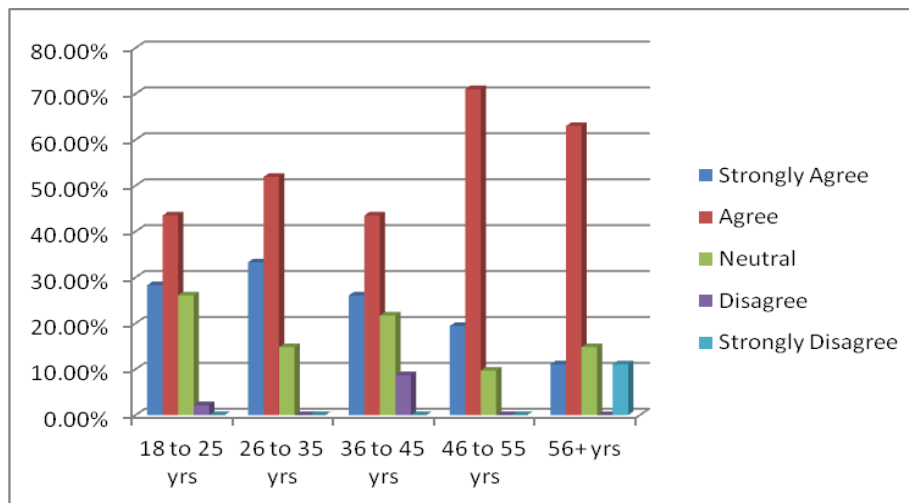


Figure 7.74: Participants' perceptions of firewalls as increasing EHR security, by age.

– Restricted system access

Chi-square test results yielded a significant association between participants' age and their perceptions of the effectiveness of restricted system access in increasing EHR security ($\chi^2 = 34.19$, $df = 16$, $p = 0.005$). Although agreement is high across the age groups, stronger agreement is evident in younger respondents and declines with old age. Gender was not found to be significantly associated ($\chi^2 = 8.01$, $df = 4$, $p = 0.091$).

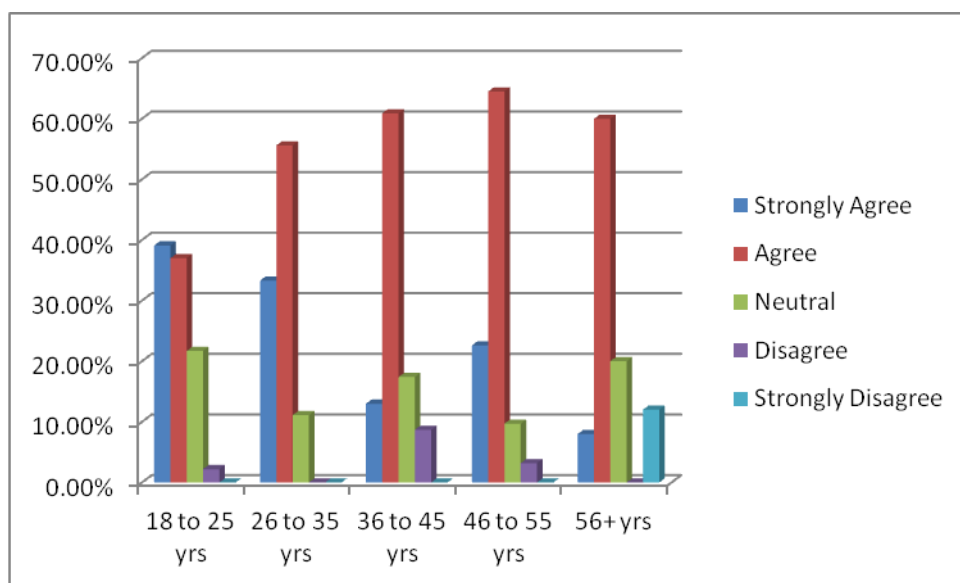


Figure 7.75: Participants' perceptions of restricted system access as increasing EHR security, by age.

- Audit trails to check record access

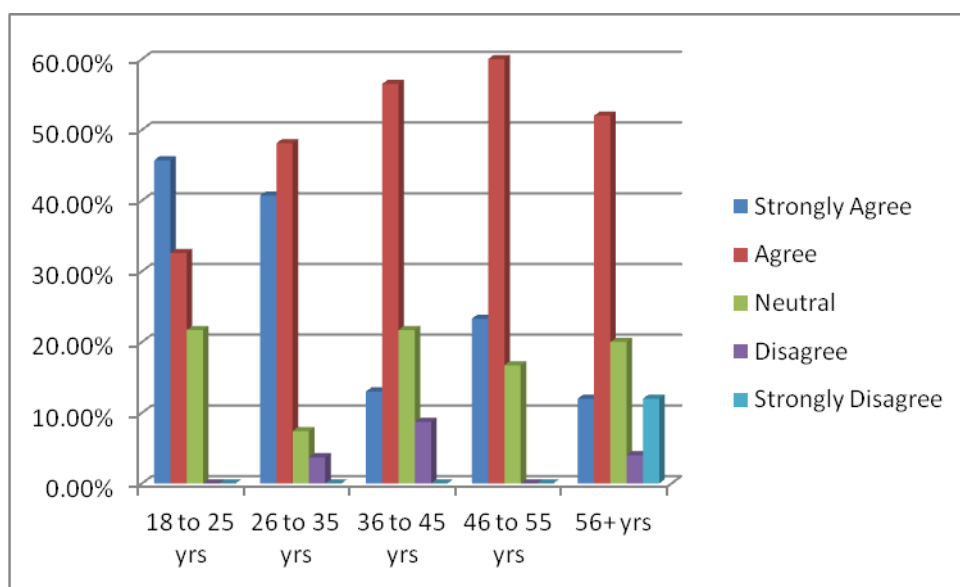


Figure 7.76: Participants' perceptions of audit trails as increasing EHR security, by age.

Chi-square test results show age as significantly associated with participants' perceptions of audit trails as increasing EHR security: $\chi^2 = 36.74$, $df = 16$, $p = 0.002$. Levels of agreement generally increase across the age groups (peaking at 46-55 years), but strong agreement declines. The age groups 18 to 35 years have high levels of “strongly agree” and 56+ years the lowest levels. No association was found in relation to gender: $\chi^2 = 3.79$, $df = 4$, $p = 0.435$.

– Encryption

Similarly to all other answers in this section, an association was found between age and participants' perceptions of encryption as increasing EHR security ($\chi^2 = 36.68$, $df = 16$, $p = 0.002$). Agreement appears to increase across the age groups, strong agreement remains steady and drops significantly in the 56 years + respondents. Levels of strong disagreement were lower overall, but highest in the 56+ year's age group. Gender was not significantly associated ($\chi^2 = 2.95$, $df = 4$, $p = 0.566$).

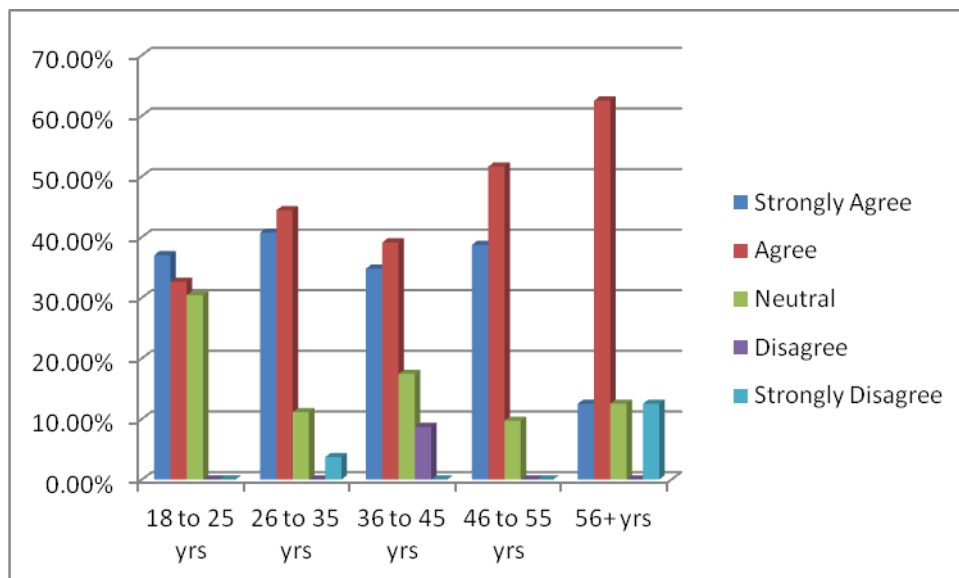


Figure 7.77: Participants' perceptions of encryption as increasing EHR security, by age.

7.2.1 Participants' comments

Participants also provided qualitative comments in response to open-ended survey questions.

There were comments by some respondents that showed not only their awareness of EHRs, but their acceptance of EHRs if security or privacy could be ensured. For example:

“If it can be run after completing all security system (example, to prevent private information leaking) it will be great.”

“The electronic is necessary but you must keep the information secret because if information is used by other people it will give some negative influence.”

However, an equal number of comments were made by respondents who lacked such awareness:

“How do you answer questions 16 to 19 if you have never heard of electronic health record?”

“I was born in 1953 so electronic medical check is quite new to me. I am quite healthy so not interested in medical materials or medical system.”

The issues of language and communication were noted by two respondents, highlighting the importance of these considerations in relation to the provision of information about EHRs, in the broader context of health service awareness:

““Not happy about translation – hard to understand the questions, not sure about the questions 19. Poor at computer so a lot of items is foreign to me”

“There is not enough information regarding medical services in New Zealand. If you could put the information on Korean society website or site running in Korean for alternative medicine.”

Several comments made have implications for the utilisation of health care services, including the following, which focused on issues of cost:

“Time consuming to see doctor, also expensive”

“Lots Zealanders end up using pain killer pills from supermarket instead of going to see doctor, most of the cases doctors give pain killers. Not worth to spend \$80 or \$100 for a box of panadol”

These comments are discussed further in the following chapter.

7.3 Results summary

It is important to ascertain whether and to what extent people from ethnic minority groups have equal opportunities for utilising health services as the ‘mainstream’ ethnic groups. Most participants from this study have shown that their utilisation of health services in Christchurch is positive. When the question of whether participants have a health practitioner or a service to which they go when they were feeling unwell was cross tabulated with age, there was a strong association ($p < 0.05$). Older respondents were more likely to make use of available health services than young respondents. The hypothesis that men will have higher self-reported health status than women was not supported as the relationship between gender and health status was not statistically significant ($p > 0.05$).

The descriptive statistics have given a good overview of how the respondents perceive the use of EHRs. The statistics and some of the qualitative responses have shown that among the survey sample there are positive feelings about EHRs. Although the results indicate that not many participants know about EHRs and the National Health Index number, this appears not to have had a bearing on perceptions relating to security; participants were equally concerned (42.4%, $n=72$) and not concerned (44.7 %, $n= 76$), and approximately 10% ($n=21$) were unsure (Figure 7.20). Interestingly gender was associated with awareness of EHRs. Here, females showed that they are more aware of EHRs than their male counterparts.

As mentioned before computer use is a commonly investigated variable in the study of technology awareness and use. Computer use was found to be strongly associated with the age of participants ($p < 0.05$). When chi-square tests were performed between participants' habit of purchasing goods on the internet and their concerns relating to information privacy, there was a strong association supporting this hypothesis ($p < 0.05$).

The following benefits of EHRs were cross tabulated and chi-square tests performed but found not to be statistically significant ($p > 0.05$):

- i. Giving participants access whenever decisions need to be made about treatment
- ii. Giving health practitioners after-hours access to health records to make treatment decisions
- iii. Enabling individuals to look at medical history at any time
- iv. Enabling individuals to look at current prescriptions and dosages at any time

Age had strong associations ($p < 0.05$) with

- i. Enabling individuals to see recent test results
- ii. Quicker access to test results
- iii. Fewer lost records and/or test results
- iv. Allowing individual choice as to who can and cannot see health records
- v. Allowing individuals to make or change appointments online for GP or hospital visits; and
- vi. Enabling recording of individual wishes (e.g. organ donation, life support)

The hypothesis of Question 17 (negative aspects of EHRs raising concerns, see 7.1.3.5) was tested with age and gender but the relationship with gender was not statistically significant. Age had a strong relationship with participants' perceptions of anticipated problems such as leaking of sensitive medical-record information and insufficiently robust data security ($p <$

0.05) but not increasing medical errors or sharing consumers' medical information without their knowledge.

In Question 18, several problems of online systems shared with EHRs had strong associations ($p < 0.05$) with age: accessibility and storage of information and deliberate acts to harm the system (hackers, crackers), but not malicious software (viruses, spyware), vendor access to the system (super users) or failure to backup medical records. Measures to increase EHR security (Question 19) were very positively perceived by respondents. Participants' ages were strongly associated with agreement that anti-virus software, firewalls, restricted system access, audit trails and encryption would increase EHR security. These associations and their implications will be discussed further in Chapter 8. The chi-square tests results are listed in full in Appendix G.

CHAPTER 8: DISCUSSION AND CONCLUSIONS

8.1 Introduction

The central idea of this thesis was that patients are generally worried about the security and confidentiality of their personal health information aggregated in EHR systems. As supported by the literature review from this thesis and also from participants' survey results, the study sets out to highlight the key findings of the survey. Whenever applicable, comments from the participants will also be used to highlight the findings.

The study's main aim and hypothesis are:

Aim: To demonstrate the relationships of New Zealand Chinese and Korean demographic characteristics (age, gender and health states) and the perceptions that they have regarding EHR systems with the specific focus towards the areas of security and confidentiality.

Hypothesis: The participants' ages, highest education attained, literacy in computer use, and health states will have an influence on the attitudes and perceptions for the use of personal health information and security and confidentiality of electronic health records.

8.2 Attitudes of survey participants towards EHRs

Attitudes of consumers toward EHRs are generally positive (Chhanabhai, Hunter, & Holt, 2006; Hunter, Whiddett, Norris, McDonald, & Waldon, 2009; Payper, Amery, & Crook, 2004) however, patient privacy and data security concerns remain a barrier for EHRs' widespread diffusion (Chhanabhai & Holt, 2007; Widdett et al. 2006; King et al, 2012). Empirical studies have shown that both consumers and providers surveyed have positive attitudes toward EHRs. Wright et al. (2010) conducted a study to assess attitudes of physicians towards health

information exchange. The results showed that a total of 16% physicians were very concerned while 55% were somewhat concerned about security of patients' information. In the California Healthcare Foundation Survey 67% of the national respondents felt "somewhat" or "very concerned" about privacy of their personal information (Bishop, Holmes, & Kelly, 2005).

This study has found no relationship/association between Korean and Chinese perceptions on security and privacy of their medical records and participant demographic variables. When chi-square tests were performed using age and gender of the participants there was generally no statistically significant associations with perceptions on security and privacy of electronic health records. However, despite not finding an association these consumers reported their main concerns as being the risk of EHRs leaking sensitive medical information and allowing sharing of their medical information without their knowledge (70% in agreement regarding these potential problems, respectively). The failure to detect significant associations might be because the sample size was too small or that is how participants feel and there were no associations to detect. There is literature to support the findings from this study that most patients had favourable perceptions about EHRs and only a small number were concerned about confidentiality of their health information (Hassol et al., 2004; Luchenski et al., 2012; Zurovac, Dale, & Kovac, 2012). Culture could also play an important role in the way respondents of this study perceive the use of EHRs and their health information (Nylor, 2010).

The attitudes of potential adopters of EHRs are relatively important as is shown in the comments respondents have made about knowledge of EHRs and computer use. For example, one participant commented that he/she was less familiar with EHRs and as a result was not sure about how to answer question (19) on perceptions of EHRs. Question 19 had the common computer terms that were used in the instrument illuminated before the participants attempted to answer the question.

Participants:

- Not happy about the translation-hard to understand the questions, not sure about questions 19. Poor at computer so a lot of items are foreign to me.
- How do you answer questions 16 to 19 if you have never heard of electronic health record?

Such comments as those above, provide guidance for a proposed future direction of making sure that participants are more aware of the technology and hence so that they will know what they are talking about.

The theory of user acceptance of technology (Fishbein & Ajzen, 1975; Ajzen, 1991; Taylor & Todd, 1995; Davis, 1989) is important especially in the health sector with the advent of EHRs. These theories indicate that for users of IT (EHRs) acceptance, intention and behaviour are shaped by the principal user's cognitions when it is associated with the perceived usefulness of the IT (EHRs). The theories are summarised by Venkatesh et al. (2003) in the acceptance model in Figure 8.1

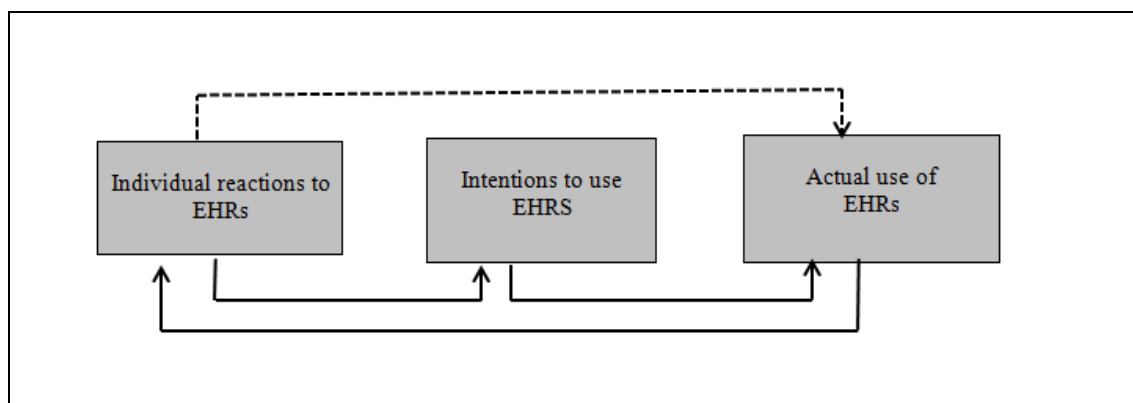


Figure 8.1: Basic Concept Underlying User Acceptance Model: Adapted from Venkatesh et al., (2003)

The user acceptance model is important especially as the momentum of IT use in the health sector has grown immensely in the past decade. Health consumers' attitudes towards EHRs may ameliorate once they have the chance to experience the actual use of EHRs. Angsty and Agrawal (2009) have noticed that health consumers' concerns about information privacy are shifting as the use of the Internet spreads.

The results from the present study have revealed that 81% of the respondents use the Internet on a regular basis (Figure 7.17). This may confirm the point put across by Angsty and Agrawal (2009) that people's concerns about health information are shifting with increased use of the Internet. Harris Interactive & Westin (2002) categorized people into clusters according to their beliefs on privacy of information. The categories were 25% Privacy Fundamentalists; 55% Privacy Pragmatists, and 20% Privacy Unconcerned. After six years the same survey had shifted from what had been consistent over the past decade with Privacy Fundamentalists growing to 34%, Private Pragmatists to 58%, and Privacy Unconcerned dropping to 8%. This confirms the concerns that consumers' perceptions shift as the use of the Internet in EHRs and accessing to health information continues. However, overall EHRs have issues that warrant consideration. These are the issues of privacy and confidentiality. As stated in the literature review this thesis did not deal with user acceptance but this area of research is worthy of pursuing in future as previously mentioned.

8.3 Survey participants' use of CAM health care services

For many decades, Traditional Chinese Medicine (TCM) has been used as a type of primary health care in China and its neighbouring countries such as Vietnam and Korea (Xue et al., 2006). In the recent years, the use of TCM has also increased in the Western world where it is regarded as a form of alternative or complementary medicine (CAM) (Xue et al, 2006; Barnes et al., 2008, Thomas et al, 2001). When Thomas et al. (2001) conducted a population based

survey on the use of CAM in England they found that responders were older and more likely to be women. When the use of CAM was compared by age and gender it was commonly reported more by women than men. In the United States the trend for CAM use was more frequent among adult women aged 30-69 years. It was found that these adults had higher levels of education (Barnes & Bloom, 2008).

The present study found that about half of the participants had visited a CAM worker over the past 12-month period. The use of CAM tended to be highest among the 56 years and older age group, and lowest among the 18-25 year age group (Figure 7.53). These results seem to concur with Barnes and Bloom (2008); Xue, Zhang, Lin, Da Costa, and Story (2007) who both noted that respondents older than 65 years of age were less likely to use CAM than those younger than 65 years of age. However, the findings from this study make intuitive sense – in that older respondents were perhaps more likely to have been born and raised in either Korea or China, where traditional Chinese medicine is more widely practised, and that consequently they may be more likely to continue to consult TCAM while resident in New Zealand.

In this study both male and female participants report utilising CAM. A significantly higher proportion of men (40%) had visited a complementary or alternative medicine worker or traditional healer over the last 12 months than women (30%). This result conflicts with Barnes & Bloom (2008) and Thomas et al. (2001) who both found that the use of CAM was more prevalent among women than men.

8.4 Key findings of this study

The key findings of the study are listed below.

- Older participants were generally more likely to visit health practitioners when they were not well than younger participants. Gender was not significant as far as visiting health practitioners when feeling unwell was concerned.

- Respondents aged 56+ years and older were more likely to report problems with their health status than younger participants. The trend changed when reporting feelings of pain/discomfort where those participants aged 46 and older reported experiencing pain/discomfort.
- There were strong associations between gender and utilisation of CAM, with men more likely to consult CAM practitioners. Older people were more likely to use CAM and visit CAM practitioners than younger people.
- Computer use is regular among age groups 18 to 35 years and then 46 to 55 years. There is a decline of computer use among age groups 36 to 45 years and then 56 + years.
- A decline in email use is also noticeable among the 36 to 45 age group and 56+ year age group. The 56+ year age group reported the highest proportion of people who have never used email.
- Security of medical records was not associated with either age or gender. The same trend applied to awareness of the NHI.
- Women were more likely to be aware of EHRs than men. Age had no significant relationship with awareness of EHRs.
- There were no significant relationships between age, gender and a number of perceived benefits of EHRs, including giving participants access whenever decisions need to be made about treatment, giving health practitioners after-hours access to health records to make treatment decisions, enabling individuals to look at medical history at any time, or enabling individuals to look at prescriptions and dosages at any time.

- The 56+ year age group had a higher proportion of those who agree that EHRs are beneficial in terms of enabling individuals to see their test results, compared to the other age groups.
- Participants agree with the perceptions of EHRs resulting in fewer lost results. Age was significantly associated with ‘strong’ agreement peak in the younger 26 to 35 year age group. General agreement was highest in the 56+ years age group.
- There was an association of age with the EHR benefit of choosing who can and cannot see health records. The proportion of younger age groups were highest in the “strongly agree” category while the proportion of older respondents peaked in “agree” category.
- The younger age groups rated highest in terms of agreeing that EHRs will allow individuals to make or change appointments online for GP or hospital visits. Those in the 56+ years age group recorded the highest levels of agreement regarding the EHR benefit of enabling individuals to record their wishes.
- Neither gender nor age were associated with the perception that EHRs might increase medical errors, or allow sharing of medical information without consumers’ knowledge. However, younger respondents (18-35 years) were significantly more likely to perceive EHRs as problematic in terms of leaking medical-record personal information, and having insufficiently robust data security.
- Age and gender were not associated with perceptions of EHRs as prone to malicious software (viruses, spyware) or failure to backup medical records. All age groups and both males and females shared the same views on this topic.

- Higher numbers of younger respondents agreed that vendor access to the system (super users) was a potential risk to EHRs online however, the older (56+) respondents had a high degree of disagreement with this scenario.
- The middle age groups had higher proportions of respondents associated with participants' perceptions of long-term accessibility and storage as an online problem for EHRs. On the other hand a higher proportion of older participants reported neutrality on this issue.
- Age showed a strong association with participants' perceptions that EHRs were vulnerable to deliberate acts to harm the system (hackers, crackers). The highest proportion of agreement was among the youngest age group.
- Age was significantly associated with participants' perceptions of a variety of measures to increase EHR security. Older respondents had the highest levels of agreement regarding anti-virus software, firewalls, restricted system access, audit trails and encryption increasing EHR security. Younger respondents were more likely to 'strongly agree' with the security merits of restricted system access and audit trails.
- There was an association between the participants' age and their perception on firewalls as a security measure for EHRs. The same pattern of agreement as in firewall is noticed in anti- virus software. There was also an association between age and the participants' perceptions of the effectiveness of restricted system access as a security measure for EHRs. The age group with the youngest participants has the highest proportion in the "strongly agree" category. The association of age with perceptions on audit trails as security measures for EHRs had the levels of agreement increase across the age groups and strong agreement declines. The proportion of those that agree that encryption

increases EHR security also increased with age. The age group with the youngest participants also had the highest proportion in “neutral” category. This neutral category declines with older age groups although it is elevated in the 36 to 45 years age group.

8.4 Limitations

8.4.1 Study Limitations

Prior research limitation: There was lack of prior research on the topic. Prior research studies are important as they form the basis for the literature review and understanding the research problem under investigation. However, the study was able find a few research items especially on demographic characteristics of this same population, done on in Christchurch. There was little research done.

Self-assessment limitation: The questionnaire may be biased as it was based on self-assessment and self-reported data which sometimes has its own limitations. There is a tendency for telescoping (that is recalling events that occurred at one time as if they occurred at another time) Huberman & Miles (1994). Therefore, there is a possibility that utilisation health services may not be fully representative of accurate answers on how often the participants had visited practitioners over the past 12 month period. If there was a bias it must have been very small as the data collected was quite robust for analysis.

Language limitations: Participant comment, “not happy about the translation” It is generally assumed that ‘foreign’ Language may differ qualitatively from research in the ‘home’ language (Smith, 1996). Translation may not often quite convey ‘original’ meanings and associations (Derrida, 1991). Sometimes a word will involve multiple meanings and associations in one cultural and linguistic context that will not automatically have the same in another culture. If that is the case then the instrument would have been interpreted differently by the participants.

However, the participants from this study may have answered the questionnaire more satisfactorily as there was enough robust data to perform analyses for robust results.

8.4.2 Recruitment limitation

A number of factors had a negative influence on the speed in with which the recruitment time of study progressed and consequently the final sample size. Firstly, the Master of Health Sciences Degree thesis programme started on the 1st of July, 2011. The initial recruitment process did not start until 9th January 2012. This was due to delays in the ethics approval. The sign off of the human ethics committee approval was received the 21st December, 2011. By then it was already the Christmas festive season. Secondly, the Chinese and Korean have their own festive season from January to February. The year 2012 was a special year for the Chinese and Korean, Year of the Dragon therefore the festive season did not end until 15th of February 2012. The recruitment process had to be prolonged up to the end of March 2012 in order to get more participants. Despite all the delays the study managed to get or accomplished in obtaining enough participants to produce reliable results. However, with a longer timeframe the study could have been conducted with a larger population sample and other target samples could have been reached.

8.5 Recommendations for future research

Despite having a number of limitations the study has achieved its aims. Improvement in some of the limitations should be a focus of future research.

The population for this research was from people who identify themselves as Chinese and Korean in Christchurch. Future research could look at conducting the research on attitudes of access to health information with Chinese and Korean participants from other cities such as Wellington, Auckland and Dunedin. A post-attitudes survey on EHRs and access to information might be conducted supplemented by qualitative data collection using professional

interpreters to perform interviews, observations or meetings with the focus groups. If the qualitative data collection is done from more than one city, it will be advantageous as it will be possible to obtain a larger overall sample.

Further studies could investigate attitudes of Chinese and Korean groups regarding the doctor-patient relationship and access control to their EHR information.

8.6 Recommendations and implications from this study

Perhaps one of the most important tasks on a local level is to educate Chinese and Korean health consumers in order to help increase their awareness of EHRs. If consumers in general have a clear understanding of the EHR system, they may appreciate more of the aims of the EHR. Furthermore the New Zealand health sector already has a NHI in use. The majority of respondents from this study indicated that they have little or no knowledge about the NHI and their own NHI number. On a national level, educating consumers about the concept of the NHI may decrease fears that they may have in regards to their health information. The Chinese and Korean communities will need to know what the benefits there are for using the NHI. Increase in health consumer awareness will also result in the understanding of the benefits of the NHI and how their data held on the NHI is managed. The comment, *“If [EHR] can be run after all security system (example, to prevent private information leaking) it will be great.”* Once consumers’ awareness increases, fears of access to information or accuracy of information will be eliminated. In this case, it is recommended that websites of the Ministry of Health be published in different languages (simple Chinese or Korean) for a better understanding of this NHI concept.

Health consumers will need to be educated about consumer rights. The Health Information Code 1994 in New Zealand is a code of practice that applies certain rules to health care providers and consumers to ensure that individual privacy is protected. It is recommended that

the code be written in consumers' arterial languages. Once the consumers are educated about their rights the benefits are considerable. For example, consumers will be aware of their health treatment plan and as a result there will be an improvement in the overall of their health status. Another benefit of the health consumer getting involved in their treatment plan is that they will be able to check their medical records for accuracy and that any additions or subtractions from that record are done by people who are authorised to do so. Consumers will be able to make references to useful websites from the Ministry of Health.

New Zealand has decided not to have interoperable EHRs at the national level but has opted for a decentralized EHR structure. As discussed in the previous chapters of this study, technologies provide a myriad of opportunities and benefits for the consumer but at the same time may pose risks to consumer privacy. Because of this, it is advisable to have a policy in place at each level of the EHR structure to deal with any security breaches that may occur. The following action plan of establishing an audit programme is suggested:

- 1) Conducting a detailed assessment of potential vulnerabilities and risks to confidentiality, integrity and availability of health information.
- 2) Implementing security measures that will reduce risks and vulnerabilities to a certain degree.
- 3) Selecting a security officer who should be responsible for security. Her/his job description should be documented.
- 4) Implementing procedures of supervision and authorisation for the members of the workforce who work with sensitive health information.
- 5) Establishing policies and procedures to make sure that the workforce has an appropriate access to sensitive information as prescribed. (HHS, 2013).

Stringent measures will need to be put in place so that all those who are not involved in the direct care of consumers such as insurers, marketers, employers, pharmacists and medical researchers are not allowed to have access to confidential information that is stored in EHRs.

All personal health information aggregated in EHRs should be de-identified for use with researchers or accredited organisations who may need the information for surveillance and research purposes, and quality control. The de-identification may help in avoiding information confidentiality and patient privacy breaches.

Health organisations that use the email and the Internet for data exchange should make sure that they have a policy in place and that that policy is regularly revised.

8.7 Implications for policy makers

This survey sample has indicated that their utilisation of medical services is almost 100%.

Continuing education on such matters as having personal medical tests performed for example, BP or CAP tests is paramount. The educational approach may need to be culturally sensitive and include the use of Chinese and Korean media (television and radio) side by side with English. Other aspects to include are the provision of health professional interpreters and translation services for this population.

New Zealand already has a number of functioning regional EHRs in place. Therefore, it is advisable to appreciate Chinese and Korean health beliefs and incorporate them when implementing fully interoperable EHRs. Once Chinese and Korean consumers know that their health beliefs are appreciated it will be easier for them to focus their attention on the perceptions of EHRs. For example, a Chinese/Korean health belief is that the good health of an individual should have a balance of flow “Qi” between “Yin” and “Yang” organs (Yu, 2001). “Qi” is a principal substance whose movements produce everything that constitutes the universe. “Yin” constitutes dark, cold, inactive, negative and female like features. “Yang”

represents bright, hot, active and male like features. Traditional medicine and practices such as these health beliefs are often lost and not acknowledged by western health sectors (Tse et al. 2013). Incorporating such traditional medicine and practices features in the EHRs will go a long way in attracting the attention of these groups of people to the new technology. It is important to incorporate Traditional Chinese Medicine so that TCM practitioners are able to work side by side with the western model of health for the benefit of Chinese and Korean communities.

8.8 Conclusions

Over the last few decades the health profession has undergone considerable transformation. The introduction of information technology and consumer health informatics has significantly transformed the traditional doctor-patient relationship. A patient is now regarded as a consumer, encouraged to participate actively in decision making about their own health.

However, patients' records are still kept in paper-based and electronic –based records resulting in fragmentation and complexity of health information. The emergence of the EHR is a response to the fragmentation and duplication of information that has the potential of increasing chances of medical errors. However, the literature review from this study has shown that New Zealand already has functioning fully interoperable EHRs. Observations of the Ministry of Health and results from this study have shown that there is still a need for consumers' involvement in determining the access to their information as awareness education still focuses on providers (Ministry of Health, 2011).

EHRs have their own drawbacks despite their myriad of advantages mentioned in the literature. There are recent studies that have looked at consumers' perceptions of EHRs in New Zealand (Chhanabhai & Holt, 2007; Hunter et al. 2009; Widdett et al. 2006). These studies were limited in the sense that they centred their focus on mainstream ethnic groups (Pakeha, Māori and

Pacific Islanders) in New Zealand. Hunter et al (2009) and Widdett et al (2006) used telephone interviews and focus groups in their studies. Chhanabhai and Holt (2007) conducted a quantitative study of randomly selected sample. The research methods for this study concurred with Chhanabhai & Holt (2007) but differed in that the sample of this study was a non-randomly selected sample of Chinese and Korean communities in Christchurch, New Zealand. The review of the literature mentioned in this study aimed at giving the reader insight into how an EHR system plays a role of promoting a holistic concept of health care delivery in the modern health care system.

The core functions of EHRs were elaborated in Chapter Three. The system has a number of physical attributes that make it a good fit for the capture and storage of health information. EHRs with decision support elements help in detecting medical abnormalities and provide speedy communication among health professionals around the globe. However, despite these immense benefits, there are also barriers and problems EHRs encounter. Such issues and barriers include access rights, interoperability, unified standards, and return on investment (ROI). The various coding schemes, ICD-10-AM, SNOMED-CT, UMLS and various standards ASTM E31, CEN TC215, and HL7 play a major role in an interoperable EHR that can be recognised globally. The lack of full development of these standards poses a problem in the development of the technology globally. Further barriers to implementing the system included privacy and security which were the focus of Chapter Four.

Threats to health information aggregated in EHRs emphasise the need for health information security measures to be put in place. The main threats to health information come from insiders. These threats may emanate from inappropriate access of patient data by internal agents who exploit vulnerability of information systems (NRC, 1997; Johns, 2002). The organisation threats mentioned in Chapter Four ranged from insiders who make innocent

mistakes and cause accidental disclosures to vengeful employees and outsiders who mount attacks (Chapter 4.3).

Additional threats to health information were discussed: malicious software (viruses, spyware); vendor access to the system (super users); long-term accessibility and storage of information; deliberate acts to harm the system (hackers, crackers) and failure to backup medical records. Both sets of threats pose risks that need to be addressed. Without adequate security measures in place the threats are likely to compromise the integrity and availability of information. As discussed earlier, integrity involves the originality, trustworthiness, completeness and correctness of information while availability ensures that information is readily accessible to authorised users. The five main security functions: authentication, authorisation, access control, accountability and availability, were also detailed. Other security measures discussed in this study include anti-virus software, firewalls, audit trails and encryption.

Chapter Five focused on the historical background of technology in the New Zealand health sector. The New Zealand EHR and models presented in Australia, the USA and Canada were discussed and compared, along with the movement of the New Zealand Ministry of Health to opt for a decentralised EHR noted. The importance of HIPAA and the Health Information Privacy Code 1994 for the EHR system was outlined and the Health Information Standards Organisation discussed in terms of setting the standards for network security in New Zealand and internationally. The New Zealand Network Policy for general and other health practitioners will make sure that health practitioners adhere to the agreed health standards and make sure that the on-going privacy of patients is maintained. The network connectivity standards that Network of Networks supply are Health Information Service Organisation (HISO) approved. HealthLink is a member of the Connected Health Network of Networks

Company (Table 5.1). New Zealand Ministry of Health is making progress in implementing EHRs locally, regionally and nationally. TestSafe in Auckland DBHBs and PriSM in the West Coast DHB are a testament to these progresses.

Participants from this study have shown that their knowledge for EHRs was limited. However, when these participants were presented with benefits that EHRs may bring to their wellbeing, the majority of the participants had positive perceptions about EHRs. Participants were also presented with problems that EHRs may encounter and that would affect the security of their information, the participants were relatively positive towards the problems mainly concerned with direct access to their medical records. Perceptions that EHRs might leak sensitive medical record information; insufficient robust data to protect information; vendor access to the system; long term accessibility and storage of information and vulnerability of EHRs to hackers and crackers were associated with the age of the participants. When participants were introduced to security preventative measures that may be applied to EHRs to keep their information secure, all ages of the participants were related to these measures. The measure included anti-virus software, firewall, restricted system access, audit trails and encryption. If these preventative measures are put in place this could be a sign for policy makers that Chinese and Korean people are or may be ready to accept the new record system.

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Appendix A: English version Questionnaire

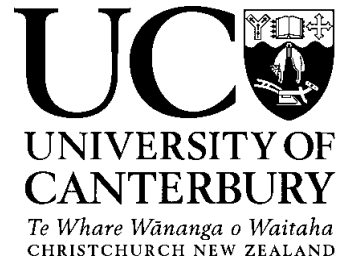
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ATTITUDES IN THE USE OF ELECTRONIC HEALTH RECORDS (EHRs) INFORMATION

Please tick the best answer for you.

Q1 Do you have a health practitioner or service, for example, a doctor or a nurse or other services that you usually first go to see when you are feeling unwell or are injured?

- ☐ Yes → Go to Q2
- ☐ No → Go to Q3

Q2 What sort of practitioner is this? ***Please tick all that apply to you from the list below.***

- ☐ General Practitioner (GP)/ Family Doctor
- ☐ Chemist or Pharmacist for health advice or medication only
- ☐ Accident or Emergency at a public hospital
- ☐ Accident and Emergency at private clinic
- ☐ Traditional Medicine Practitioner
- ☐ Other (Specify) _____

Q3 Over the last twelve months, has a practitioner (For example, a doctor, nurse or other practitioner) either carried out or arranged for you to have any of the following? Please tick all that apply to you.

- ☐ CAP (Blood) test for prostate cancer
- ☐ Blood pressure test
- ☐ Immunisation (for anything)
- ☐ Flu injection
- ☐ Diabetes test
- ☐ Discussed smoking
- ☐ Cholesterol test
- ☐ No/None of the above
- ☐ Don't know

By placing a tick in each group below (for questions 4 to 8), please indicate which statements you would choose to describe your health state today. Do not tick more than one circle in each group.

Q4 MOBILITY (Your physical ability to walk about and to move around)

- ☐ I have no problems in walking about
- ☐ I have slight problems in walking about
- ☐ I have moderate problems in walking about
- ☐ I have severe problems in walking about
- ☐ I am unable to walk about

Q5 SELF-CARE (Your independence in daily personal care)

- ☐ I have no problems washing or dressing myself
- ☐ I have slight problems washing or dressing myself
- ☐ I have moderate problems washing or dressing myself
- ☐ I have severe problems washing or dressing myself
- ☐ I am unable to wash or dress myself

Q6 USUAL ACTIVITIES (For example, work, study, house work, family or leisure activities)

- ☐ I have no problems doing my usual activities
- ☐ I have slight problems doing my usual activities
- ☐ I have moderate problems doing my activities
- ☐ I have severe problems doing my usual activities
- ☐ Unable to do my usual activities

Q7 PAIN / DISCOMFORT (Physical or bodily hurt or an uncomfortable physical sensation)

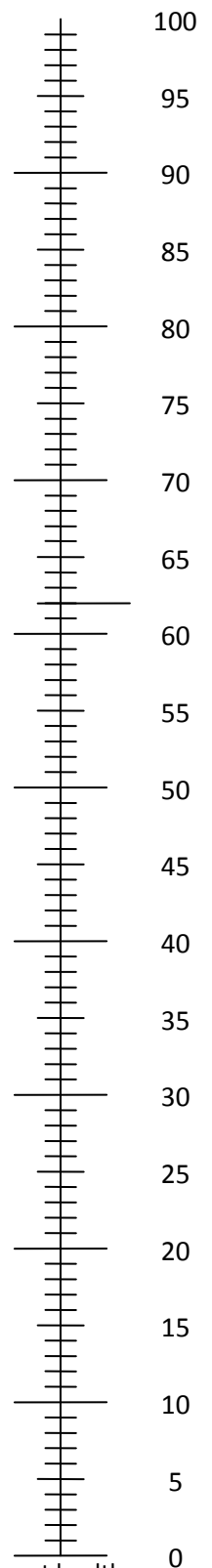
- ☐ I have no pain or discomfort
- ☐ I have slight pain or discomfort
- ☐ I have moderate pain or discomfort
- ☐ I have severe pain or discomfort
- ☐ I have extreme pain or discomfort

Q8 ANXIETY /DEPRESSION (Physiological sensation relating to “worry”)

- ☐ I am not anxious or depressed
- ☐ I am slightly anxious or depressed
- ☐ I am moderately anxious or depressed
- ☐ I am severely anxious or depressed
- ☐ I am extremely anxious or depressed

Q9 To help people to know how good or bad your health is, we have drawn a scale on which the best state you can imagine is 100 and the worst state you can imagine is 0. We would like you to indicate on this scale how good or bad you would say your health is today. Please **mark a point on the scale** to show which point indicates how good or bad you would say your health state is today.

The best health you
can imagine



The worst health
you can imagine

COMPLEMENTARY OR ALTERNATIVE HEALTH CARE PRACTITIONERS

Questions 10 to 12 ask about health care providers (Examples, Diagram ACP) and the way that you have used them over the last 12 months.

Q10 In the last 12 months, did you see any complementary or alternative health care worker or a traditional healer, for example, Chinese or Korean traditional practitioners such as those in

Diagram ACP below.

- ☐ Yes
- ☐ No
- ☐ Don't know

Q11 Who are those you visited? Please indicate by ticking in the boxes in **Diagram ACP** below, as many as you may have seen in the past 12 months.

Q12 For all seen in question 11, how many times have you seen each of them in the past 12 months? **Record the number for each on the lines marked in Diagram ACP below.**

DIAGRAM ACP

	Please tick the BOX below to answer Question 11	Please write on the line below, the number of times to answer Question 12
Massage therapist	<input type="checkbox"/>	_____
Acupuncturist	<input type="checkbox"/>	_____
Homeopath or naturopath	<input type="checkbox"/>	_____
Herbalist	<input type="checkbox"/>	_____
Osteopath	<input type="checkbox"/>	_____
Aromatherapist	<input type="checkbox"/>	_____
Chiropractor	<input type="checkbox"/>	_____
Traditional Chinese medicine practitioner	<input type="checkbox"/>	_____
Spiritual Healer	<input type="checkbox"/>	_____
Chinese Traditional healer	<input type="checkbox"/>	_____
Korean traditional healer	<input type="checkbox"/>	_____
Other (Please specify)	_____	_____

THIS SECTION IS ABOUT Electronic Health Records (a record of a patient's health information) held in an electronic format, not a paper record.

Q13 Your Computer Use (*please tick the answer for each statement below*)

	Regularly	Fairly Regularly	Sometimes	Seldom	Never
I use a computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use E-mail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use the internet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I buy things on the internet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 Security and Your Medical Records

	Yes	No	Not sure
Are you concerned about the confidentiality of your medical records?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you know about the National Health Index?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q 15 Considering your health information, had you ever heard of Electronic Health Records?

- ☐ Yes
- ☐ No

Q16 The following are proposed benefits to **YOU** of Electronic Health Records. How do you feel about them?

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Giving you access whenever you need to make decisions about your treatment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Giving those who treat you after normal hours access to your health records to make decisions about your treatment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enable you at any time to look at your medical history.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enable you at any time to look at your current prescriptions and dosages.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enable you to see your recent results.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quicker access to your test results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fewer lost records and/or test results.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allow you to choose who can and cannot see your health records.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allow you to make or change appointments online for GP or hospital visits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enable you to record your wishes (e.g. organ donor? Life support?)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 Despite the proposed benefits that have been mentioned, there are also some anticipated problems with Electronic Health Records. How do you feel about them?

(Please tick your answer for each statement below).

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Electronic Health Records could increase medical errors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic Health Records could lead to sensitive medical-record information leaking out	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic Health Records could allow sharing of your medical information without your knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic Health Records may not have strong enough data security installed into the system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 The above were potential problems that may face Electronic Health Records, below is a list of problems that are faced by most current online systems not just Electronic Health Records.

Do you think these would affect **YOUR** Electronic Health Records? (***Please tick your answer for each statement below***)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Malicious software (Viruses, Spyware)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vendor access to the system (Super users) Vendors are the sellers, suppliers or retailers of the Electronic Health Record system.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Long-term accessibility and storage of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deliberate acts to harm the system (hackers, crackers)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Failure to backup of your medical records	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Below is an explanation of common computer security terms that are in use today.

Anti-virus software: is a computer program that can be used to scan files to identify and eliminate computer viruses and other malicious software (malware).

Firewalls: A firewall is equivalent to a lock on a door. It permits only authorised users such as those with a key or access card to enter. A firewall has built-in filters that block unauthorised or access to enter. A firewall has built-in filters that block unauthorised or potentially dangerous material from entering the system. It also logs attempted intrusions.

Restricted system access: this allows only authorised people to access parts of a system; they will not be able to access the whole system, only certain relevant parts of it.

Audit Trail: a chronological record of system resource usage. This includes user login, file access, other various activities, and whether any actual or attempted security violations occurred, legitimate and unauthorised.

Encryption: the process of mathematically changing characters into a form that can be read only by the intended receiver. This allows for information to be sent and stored electronically in a secure manner.

Q19 Do you think that if the following were implemented your Electronic Health Record would be more secure?

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Anti-virus software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewalls	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restricted system access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Audit trails (<i>so you can see who has been doing what with your record</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encryption	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Demographic Information

Q20 My gender is: (*please tick*)

- ☐ Male
- ☐ Female

Q21 My age is: (*please tick the age that you belong to*)

- ☐ 18 to 25
- ☐ 26 to 35
- ☐ 36 to 45
- ☐ 46 to 55
- ☐ 56 to 65
- ☐ 66 to 75
- ☐ 76 +

Q22 Which ethnicity do you identify with? (*Please, tick the ones that apply to you*). *You can tick more than one.*

- ☐ Chinese
- ☐ Korean
- ☐ Indian
- ☐ Japanese
- ☐ NZ European/other Europeans
- ☐ Khmer/Kampuchean/Cambodian
- ☐ Philippine
- ☐ Vietnamese
- ☐ Sri Lankan
- ☐ Other (Please specify) _____

Q23 In which country were you born? *Tick the country that you were born in.*

- ☐ China
- ☐ Korea
- ☐ New Zealand
- ☐ Indonesia
- ☐ Japan
- ☐ Burma
- ☐ Taiwan
- ☐ Malaysia
- ☐ Cambodia
- ☐ Philippines
- ☐ Other (please specify) _____

Q24 In which year did you first move to New Zealand?

If you were not born in New Zealand, please write down the year you arrived in the box below

Q25 In which languages could you have a conversation about a lot of everyday things?

Please tick the languages.

- ☐ Mandarin
- ☐ Korean
- ☐ Cantonese
- ☐ English
- ☐ Other (Please, specify) _____

Q26 What is your highest education achieved? **(Please circle one answer)**

- (1) Primary (2) Intermediate (3) High School
- (4) Undergraduate (5) Diploma (6) Bachelor Degree
- (7) Postgraduate or higher (8) Vocational (9) No Schooling

Q27 Apart from secondary school qualifications, do you have another qualification? Do not count incomplete qualifications or qualifications that take less than 3 months of full-time study. **Please tick the highest qualification that you have.**

- ☐ Bachelors degree, e.g. BA, BSc, LLB
- ☐ Bachelors degree with honors
- ☐ Masters degree e.g. MA, MSc PhD
- ☐ Diploma (not Post Graduate)
- ☐ Diploma - Post Graduate
- ☐ Trade or technical certificate which took more than 3 months full time study
- ☐ Professional qualifications like ACA, nurses, teachers
- ☐ No qualification beyond secondary school
- ☐ Other (Please, specify) _____

If you have any comments regarding any of the questions above, please feel free to make any comments in the space below:

Thank you for taking time to complete the survey. Please put the questionnaire and consent form in the envelope and put in the mail box to return it to the researcher.

APPENDIX B: Simple Chinese version of the Questionnaire



问卷调查

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对使用电子健康记录信息的态度

请在最适合你的答案前打√

问题1

当你感觉身体不适或受伤时，你有可以最初去看病的健康专业人员或服务吗？例如，医生，护士或其它服务。

- ☐ 有 → 问题2
- ☐ 没有 → 问题3

问题2 是何种类型的健康专业人员？请在下面所有适合你的答案前打√。

- ☐ 家庭医生（GP）
- ☐ 只提供健康建议或药品的药剂师
- ☐ 公共医院的急诊
- ☐ 私人诊所的急诊
- ☐ 传统中医
- ☐ 其它（请注明）_____

问题3 在过去的12个月里，健康专业人员（例如，医生，护士或其他人员）是否给你执行或安排过以下情况？请在所有适合你的答案前打√。

- ☐ 为检测前列腺癌而进行的验血（CAP test）
- ☐ 血压检测
- ☐ 免疫注射 (预防任何疾病)
- ☐ 流感疫苗注射
- ☐ 糖尿病检测
- ☐ 谈论吸烟问题
- ☐ 胆固醇检测
- ☐ 以上都没有进行过
- ☐ 不知道

在下面每一组中 (从问题4到问题8),
请选出能描述你现今健康状况的说法。每组只选出一个答案。

问题4 活动能力 (你到处走动或四处活动的的能力)

- ☐ 我到处走动没有问题
- ☐ 我到处走动有轻微的问题
- ☐ 我到处走动有适当的问题
- ☐ 我到处走动有严重问题
- ☐ 我无法到处走动

问题5 自我照顾 (你在日常自我照顾方面的独立性)

- ☐ 我在自我洗漱和穿戴方面没有问题
- ☐ 我在自我洗漱和穿戴方面有轻微问题
- ☐ 我在自我洗漱和穿戴方面有适当问题
- ☐ 我在自我洗漱和穿戴方面有严重问题
- ☐ 我无法自我洗漱和穿戴

问题6 日常活动 (例如, 工作, 学习, 家务, 家庭或休闲活动)

- ☐ 我日常活动没有问题
- ☐ 我日常活动有轻微问题
- ☐ 我日常活动有适当问题
- ☐ 我日常活动有严重问题
- ☐ 我无法进行日常活动

问题7 疼痛 / 不适 (身体上的疼痛 或身体感觉不适)

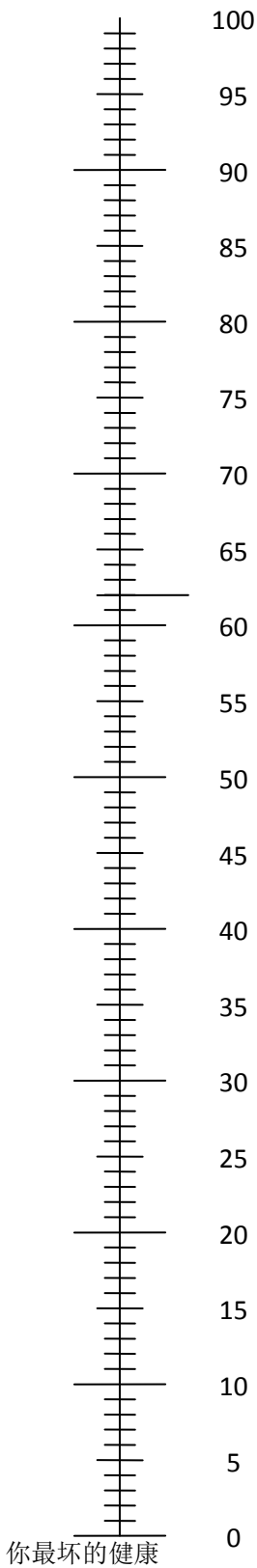
- ☐ 我没有疼痛或不适
- ☐ 我有轻微疼痛或不适
- ☐ 我有适当的疼痛或不适
- ☐ 我有严重的疼痛或不适
- ☐ 我有极其的疼痛或不适

问题8 焦虑 / 抑郁 (与“忧虑”有关的生理感觉)

- ☐ 我不感觉焦虑或抑郁
- ☐ 我感觉轻微焦虑或抑郁
- ☐ 我感觉有些焦虑或抑郁
- ☐ 我感觉严重焦虑或抑郁
- ☐ 我感觉极其焦虑或抑郁

问题9 为了帮助了解你的健康的好或坏，
我们画了一个刻度尺。在该尺上你的最好健康是**100**，最坏健康是**0**。我们
想让你在该尺上注明你现今健康的好或坏。请 **在该尺上做出一个记号**
显示你现今健康状况的好或坏。

你最好的健康



辅助的或可选择的健康专业人员

*问题10到12询问关于健康保健提供者(例如, 图表ACP)
和在过去的12个月里你使用他们的方式*

问题10 在过去的12个月里,
你见过任何辅助的或可选择的健康保健工作人员或中医治疗师吗? 例如, 下列**图表ACP**
中列出的中国或韩国传统治疗师。

- ☐ 见过
- ☐ 没见过
- ☐ 不知道

问题11 你都见过谁? 请在下面**图表ACP**中, 打V注明在过去12个月里你都见过谁?

问题12 在问题11你所见过的人中, 在过去的12个月里, 你见过他们多少次?
*在下面**图表ACP**中的横线上记录你见过他们的次数。*

图表 ACP

	请在下面的方框中打√— 回答问题11	请在下面的横线上写下你见过他们的 次数—回答问题12
按摩师	<input type="checkbox"/>	_____
针疗医师	<input type="checkbox"/>	_____
顺势疗法医生或自然 疗法医生	<input type="checkbox"/>	_____
草药医生	<input type="checkbox"/>	_____
骨科医生	<input type="checkbox"/>	_____
芳香疗法医师	<input type="checkbox"/>	_____
按摩医生(Chiropract or)	<input type="checkbox"/>	_____
传统中医治疗师	<input type="checkbox"/>	_____
精神自然力治疗师(S piritual Healer)	<input type="checkbox"/>	_____
中国传统自然力治疗 师	<input type="checkbox"/>	_____
韩国传统自然力治疗 师	<input type="checkbox"/>	_____
其他 (请注明)	_____	_____

这个专栏是关于以电子形式而不是纸张形式保存的电子健康记录
(一个病人的健康信息的记录)。

问题13 你的电脑使用 (请V出每种说法中适合你的答案)

	频繁使用	比较频繁使用	有时候使用	很少使用	从来没用过
我使用电脑	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我使用电子邮件	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我使用互联网	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我在网上购物	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

问题14 安全性和你的医疗记录

	是	否	不确定
你担心你的医疗记录的保密性吗?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
你知道国家健康指引号码 (NHI) 吗?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

问题 15 想到你的健康信息, 你曾经听说过电子健康记录吗?

- ☐ 听说过
- ☐ 没听说过

问题16 下面是预想到的电子健康记录对你的益处. 你对它们的评价如何?

	强烈同意	同意	中立	不同意	强烈不同意
不管何时你需要决定你的治疗方案，你都可以查看你的记录。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
允许在工作时间以外对你进行治疗的人员使用你的健康记录，决定你的治疗方案。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
任何时候你都可以查看你的病史。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
任何时候你都可以查看你目前的处方和剂量。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
你可以查看最近的检验结果。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
快速查看你的检验结果。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
极少丢失记录和/或检验结果	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
允许你选择谁能或不能查看你的健康记录。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
允许你在网上做或改变家庭医生或医院的预约。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
你可以记录你的愿望（例如，捐献器官？生命资助？）	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

问题17 尽管电子健康记录有上述预想到的好处，同时也有一些问题存在。
你对它们的评价如何？

(请在下面每个说法中V出最适合你的答案)

	强烈同意	同意	中立	不同意	强烈不同意
电子健康记录可能增加医疗记录错误	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
电子健康记录可能导致敏感的医疗记录信息泄露	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
电子健康记录可能在你不知的情况下与别人分享你的医疗信息	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

电子健康记录也许没有足够强烈的数据安全保障安装在系统中。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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问题18 以上是电子健康记录可能存在的潜在问题，
以下是一系列现今大多数互联网系统面对的问题，不只局限于电子健康记录。

你认为这些会影响你的电子健康记录吗？(请在下面每个说法中v出最适合你的答案)

	强烈同意	同意	中立	不同意	强烈不同意
病毒性软件 (Viruses, Spyware)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
商贩使用该系统 (Super users)。 这些商贩包括电子健康记录系统的卖家，提供者或零售商。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
长期地使用和保存信息	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
故意破坏该系统的行为 (电脑黑客 hackers)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
无法备份你的医疗记录	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

以下是一些现今使用的普通电脑安全术语的解释。

抗病毒软件(Anti-virus software):

是一种电脑程序，它能帮助扫描文件以识别和清除电脑病毒和其它带毒软件。

防火墙 (Firewalls) : 防火墙相当于门的锁。

它只允许授权的使用者，例如，有密码或有使用卡的人进入。防火墙有内装的过滤器，它能阻止未授权的使用者或有潜在危险的材料进入系统。它也记录企图入侵者。

限制性系统使用 (Restricted system access) : 这只允许授权者使用部分系统；他们只能使用相关的一部分而不能使用全部系统。

查账索引 (Audit Trail) :

按时间顺序记录的系统资料的使用。这包括使用者登陆，阅读文件，其它各种活动，是否实际发生过破坏安全或企图破坏过安全，合法或未授权者。

加密 (Encryption) :

这个程序在数学上把文字改变成只有计划中的接收者才能读到的形式。这使发送和储存信息电子化，而且安全。

问题19 你认为执行下列程序，你的电子健康记录会更安全吗？

	强烈同意	同意	中立	不同意	强烈不同意
抗病毒软件	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
防火墙	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
限制性系统使用	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
查账索引 (由此你可以看到谁一直在你的系统里做什么)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
加密	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

人口统计信息

问题20 我的性别是：（请打√）

- ☐ 男
- ☐ 女

问题21 我的年龄是：（请在你属于的年龄组打√）

- ☐ 18 to 25
- ☐ 26 to 35
- ☐ 36 to 45
- ☐ 46 to 55
- ☐ 56 to 65
- ☐ 66 to 75
- ☐ 76 +

问题22 你属于哪一个种族？（请在合适选项前打√）。你可以多选。

- ☐ 中国人
- ☐ 韩国人
- ☐ 印度人
- ☐ 日本人
- ☐ 新西兰欧洲/其他欧洲人
- ☐ 柬埔寨人
- ☐ 菲律宾人
- ☐ 越南人
- ☐ 斯里兰卡人
- ☐ 其他（请注）_____

问题23 你生于哪个国家？请√出你出生的国家。

- ☐ 中国
- ☐ 韩国
- ☐ 新西兰
- ☐ 印度尼西亚
- ☐ 日本
- ☐ 缅甸
- ☐ 台湾
- ☐ 马来西亚
- ☐ 柬埔寨
- ☐ 菲律宾

☐ 其它（请注明） _____

问题24 你在哪一年首次搬到新西兰？

如果你不是在新西兰出生，请在下方方框中写出你在哪一年到达新西兰。

问题25 你日常交际使用何种语言？请在合适的语言前打√。

- ☐ 普通话
☐ 韩语
☐ 粤语
☐ 英语
☐ 其它（请注明） _____

问题26 你达到的最高教育是什么？（请圈出一种选项）

- (1) 小学 (2) 初中 (3) 高中
(4) 大学本科 (5) 文凭 (6) 学士学位
(7) 研究生或更高学位 (8) 职业技术 (9) 未上过学

问题27 除了高中学历，你有另外一种学历吗？

未完成的学历或低于3个月全职学习的学历不算在内。 请√出你拥有的最高学历。

- ☐ 学士学位，例如，文学士，理学士，法学士
☐ 荣誉学士学位
☐ 硕士学位，例如，文科硕士，理科硕士或博士学位
☐ 文凭（不是研究生）
☐ 文凭 – 研究生
☐ 花费多于3个月全职学习的贸易或技术证书
☐ 职业学历，例如，合格会计，护士，教师
☐ 没有超过高中的文凭
☐ 其它（请注明） _____

如果你对上述所有问题有任何评论，欢迎你在下面的空格处做出评论。

谢谢你抽出时间完成此调查。

请把问卷和同意书一起放入信封中，然后放入邮筒以便邮回到调查者手中。

APPENDIX C: Korean version of the Questionnaire

질 문 지

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전자 건강 기록 정보 이용에 대한 태도

본인에게 가장 알맞은 답을 선택하세요.

Q1 자신이 아프거나 다쳤을 경우 자주 이용하는 의사나, 간호사 혹은 다른 의료 서비스가 있으십니까?

- 예→ 2번 문제로 가십시오.
- 아니오→ 3번 문제로 가십시오.

Q2 어떤 종류의 의료서비스를 이용하십니까? **아래의 해당하는 모든 사항에 표시하십시오.**

- ☐ 가정의 (GP)/ 주치의
- ☐ 약사에게 건강에 대한 조언을 듣거나 혹은 약만을 구입
- ☐ 공립병원의 응급실
- ☐ 개인병원의 응급실
- ☐ 전통적인 의료인
- ☐ 기타 (구체적으로 명시해주십시오) _____

Q3 지난 12개월 중에, 여러분의 가정의 또는 의료인이 아래의 의료관련사항들을 시행하였거나 의뢰한 적이 있습니까? 본인에게 해당하는 모든 사항에 표시하십시오.

- ☐ 전립선 암 혈액 검사(CAP test)
- ☐ 혈압측정
- ☐ 면역조치 (예방주사)
- ☐ 독감 예방 주사
- ☐ 당뇨 검사
- ☐ 흡연에 대하여 상의
- ☐ 콜레스테롤 검사
- ☐ 해당 사항 없음
- ☐ 잘모름

4번부터 8번 까지의 질문은 본인의 현재 건강상태를 묻는 질문입니다. 현재 자신의 건강상태를 가장 잘 나타내는 문장에 표시하여 주십시오. 한 개의 답안에만 표시하여 주십시오.

Q4 기동성 (걷고 움직일 수 있는 신체적 능력)

- ☐ 걷는데 전혀 문제가 없다.
- ☐ 걷는데 약간의 문제가 있다.
- ☐ 걷는데 중간의 문제가 있다.
- ☐ 걷는데 심각한 문제가 있다.
- ☐ 걸을 수 없다.

Q5 자기관리 (매일 자기관리를 할 수 있는 독립성)

- ☐ 혼자 씻고 옷 입는 데 전혀 문제가 없다.
- ☐ 혼자 씻고 옷 입는 데 약간의 문제가 있다.
- ☐ 혼자 씻고 옷 입는 데 중간의 문제가 있다.
- ☐ 혼자 씻고 옷 입는 데 심각한 문제가 있다.
- ☐ 혼자 씻고 옷 입을 수 없다.

Q6 일상생활 (일, 공부, 가사, 가족 이나 레저 활동등)

- ☐ 일상 생활을 하는 데 전혀 문제가 없다.
- ☐ 일상 생활을 하는 데 약간의 문제가 있다.
- ☐ 일상 생활을 하는 데 중간의 문제가 있다.
- ☐ 일상 생활을 하는 데 심각한 문제가 있다.
- ☐ 일상 생활을 할 수 없다.

Q7 통증 / 불편함(신체적으로 아프거나 불편한 느낌)

- ☐ 통증이나 불편함이 전혀 없다.
- ☐ 약간의 통증이나 불편함이 있다.
- ☐ 중간의 통증이나 불편함이 있다.
- ☐ 심각한 통증이나 불편함이 있다.

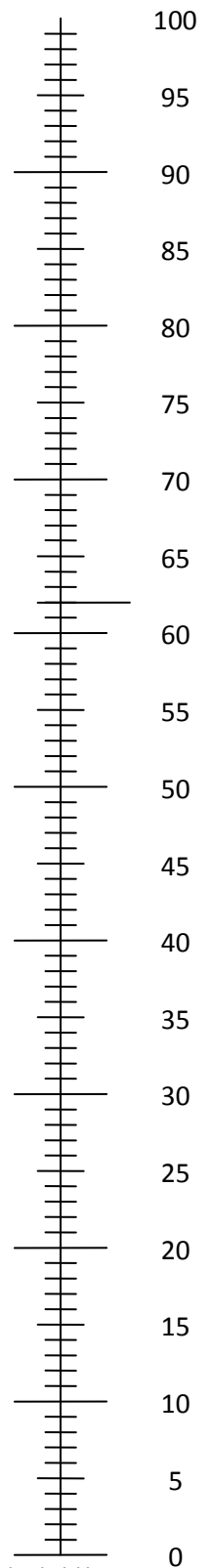
- 극심한 통증이나 불편함이 있다.

Q8 염려/우울감(걱정이나 불안에 관련된 심리적 느낌)

- 전혀 불안하거나 우울하지 않다.
- 약간 불안하거나 우울하다.
- 중간 정도로 불안하거나 우울하다.
- 심각하게 불안하거나 우울하다.
- 극심하게 불안하거나 우울하다.

Q9 당신의 건강상태에 대하여 더욱 자세히 알기 위하여, 최상의 건강상태는 100으로 최악의 건강상태는 0으로 나타내는 눈금 자로 나타낼 수 있도록 하였습니다. 현재의 건강상태를 나타내는 한 곳의 눈금에만 표시하여 주십시오.

자신이 생각하는 최상의 건강상태



자신이 생각하는 최악의 건강 상태

상호 보완적인 또는 대안적인 의료인

10번 에서 12번의 질문은 의료 서비스 제공자 (ACP 도표) 와 당신이 지난 12개월 중 이용했던 방법에 대한 질문입니다.

Q10 지난 12개월 중 상호 보완적인 또는 대안적인 의료인을 방문한 적이 있습니까? (예를 들면 아래 도표에 있는 중국 또는 한국 전통 의료인)

- ☐ 예
- ☐ 아니오
- ☐ 모름

Q11 당신이 방문했던 의료인은 누구입니까? 아래 도표에 있는 의료인중 지난 12개월 중에 방문했던 의료인 모두를 표시하여 주십시오.

Q12 당신이 지난 12 개월 중에 방문했던 의료인과 방문한 횟수를 아래의 도표에 표기하여 주십시오.

ACP 도표

	아래의 상자에 11번 문제에 대한 답을 표시하여 주십시오.	12 번 문제에 대한 답을 아래의 밑줄 친 부분에 써주십시오.
마사지 치료사	<input type="checkbox"/>	_____

침술가	<input type="checkbox"/>	_____
동종 요법 의사 또는 자연	<input type="checkbox"/>	_____
요법의	<input type="checkbox"/>	_____
약초 치료사	<input type="checkbox"/>	_____
접골사	<input type="checkbox"/>	_____
방향요법사	<input type="checkbox"/>	_____
척추지압사	<input type="checkbox"/>	_____
전통 중국 약사	<input type="checkbox"/>	_____
영적 치료사	<input type="checkbox"/>	_____
중국 전통 치료사	<input type="checkbox"/>	_____
한국 전통 치료사	<input type="checkbox"/>	_____
기타 (구체적으로 명시하여 주십시오)	_____	_____

아래의 부분은 전자문서 형식에 기록된 전자 건강 기록 (환자의 건강 정보 기록) 에 대한 것입니다.

Q13 컴퓨터 사용 (각각의 문장에 하나만 표시하십시오.)

	정기적으로	꽤 정기적으로	가끔	드물게	전혀
컴퓨터를 사용한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
이메일을 사용한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
인터넷을 사용한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
인터넷 구매를 이용한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 보안과 당신의 의료 기록

	예	아니오	확실치 않음
당신의 의료 기록에 대한 비밀 보장에 대하여 걱정하시거나 관심이 있으십니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
국가 의료 인덱스에 대하여 알고 계십니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 당신의 건강 정보에 대하여 전자 의료 기록에 대하여 들어 보신 적이 있습니까?

- ☐ 예
- ☐ 아니오

Q16 아래는 전자 건강 기록의 좋은 점에 대한 내용입니다. 당신은 아래의 내용에 대하여 어떻게 생각하십니까?

	강한 동의	동의	동의 하지도 반대하지도 않는다	반대	강한 반대
자신의 치료에 대한 결정을 내려야 할 때 자신의 의료기록정보에 접근할 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
진료 외 시간이 진료하는 의료진에게 당신의 치료에 대한 결정을 내려야 할 때 당신의 의료기록정보에 접근할 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
언제든지 당신이 자신의 과거의 의료기록정보를 볼 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
언제든지 당신이 자신의 현재의 처방기록과 투여정보를 볼 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
당신이 최근 의료 결과를 볼 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
당신의 검사결과를 빨리 볼 수 있도록 한다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
보다 적은 의료 기록과 검사 결과의 분실.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
당신의 자신의	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>의료기록을 누가 볼 수 있는지에 대하여 결정할 수 있다.</p> <p>의사와의 예약이나 병원예약을 온라인에서 변경할 수 있도록 한다.</p> <p>자신의 원하는 바를 기록할 수 있도록 한다. (장기 기증이나 생명 유지 장치의 사용)</p>	○	○	○	○	○
	○	○	○	○	○

Q17 위의 명시된 전자 건강 기록의 좋은 점에도 불구하고 우려되는 아래의 몇가지 문제점들이 있습니다. 당신은 아래의 내용에 대하여 어떻게 생각합니까?

(각각의 문장에 하나만 표시하십시오.)

	강한 동의	동의	동의 하지도 반대하지도 않는다	반대	강한 반대
전자건강기록은 의료실수를 증가시킬 수 있다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
전자건강기록은 민감한 의료기록에 대한 정보를 누설시킬 수 있다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
전자건강기록은 당신 모르게 당신의 의료정보를 공유하게 할 수 있다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
전자건강기록은 아마도 시스템에 설치된 강력한 정보 보안 장치를 갖고 있지 않을 수도 있다.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 위의 내용을 전자 건강 기록이 가진 잠재적 문제점들입니다. 아래의 문제점들은 전자 건강 기록만이 아니라 대부분의 현재 온라인 시스템들이 가진 문제점들입니다.

아래의 문제점들이 당신의 전자 건강 기록에 영향을 미친다고 생각하십니까?

(각각의 문장에 하나만 표시하십시오.)

	강한 동의	동의	동의 하지도 반대하지도 않는다	반대	강한 반대
악의적 소프트웨어 (바이러스,스파이웨어)	○	○	○	○	○
판매회사의 시스템 접근. (전자 건강 기록 시스템의 공급자나 판매자)	○	○	○	○	○
장기적 접근성과 정보 보관	○	○	○	○	○
고의적인 시스템 손상(해커, 크랙커)	○	○	○	○	○
의료기록 복구의 실패	○	○	○	○	○

아래는 현재 보통의 컴퓨터 보안 조건에 대한 설명입니다.

안티바이러스 소프트웨어: 는 악성 소프트웨어를 찾아내서 제거하는 기능을 갖춘 컴퓨터 프로그램입니다.

방화벽: 은 문을 잠그는 것과 같은 효과를 말합니다. 비밀번호나 이용카드등 인증을 받은 사용자만이 사용할 수 있습니다. 방화벽은 필터에 내장되어 인증되지 않거나 잠재적으로 위험한 통신을 막습니다.

제한된 시스템 접근: 이것은 인증을 받은 사람들만이 시스템의 일부에만 접근을 허용합니다. 시스템 전체에는 접근을 할 수 없습니다.

감사추적: 시스템의 자료 이용에 대한 시간에 따른 기록. 적법한 인가를 받은 사용자와 인가를 받지 않은 사용자의 로그인, 접근 파일, 기타의 다양한 시스템활동과 실재 보안의 위반, 보안의 위반 시도를 모두 포함합니다.

암호화: 특별한 지식을 소유한 사람들을 제외하고는 아무나 읽어볼 수 없도록 정보를 암호화하여 전달하는 과정입니다. 암호화는 정보가 안전하게 전달되고 보관될 수 있도록 합니다.

Q19 아래의 보안 시스템이 실행된다면 당신의 전자 건강 기록을 더욱 안전하게 할 수 있다고 생각하십니까?

	강한 동의	동의	동의 하지도 반대하지도 않는다	반대	강한 반대
안티 바이러스 소프트웨어	○	○	○	○	○
방화벽	○	○	○	○	○
제한된 시스템 접근	○	○	○	○	○
감사추적 (자신의 기록을 누가 어떻게 사용하는지 알 수 있다)	○	○	○	○	○
암호화	○	○	○	○	○

인구학적 정보

Q20 나의 성별은: (**표시하여 주십시오**)

- ☐ 남성
- ☐ 여성

Q21 나의 연령은: (**속하는 연령대에 표시하여 주십시오**)

- ☐ 18 to 25
- ☐ 26 to 35
- ☐ 36 to 45
- ☐ 46 to 55
- ☐ 56 to 65
- ☐ 66 to 75
- ☐ 76 +

Q22 어떤 민족에 속합니까? (**당신에게 해당하는 것 모두에 표시하여 주십시오**).
하나 이상에 표시할 수 있습니다.

- ☐ 중국인
- ☐ 한국인
- ☐ 인디언
- ☐ 일본인
- ☐ 뉴질랜드 유러피안/ 타 유러피안
- ☐ 크메르/캄푸치안/캄보디안
- ☐ 필리핀
- ☐ 베트남
- ☐ 스리랑카
- ☐ 기타(구체적으로 명시하여 주십시오) _____

Q23 당신이 태어난 국가는 어디입니까? (**당신이 태어난 국가에 표시하여 주십시오**).

- ☐ 중국
- ☐ 한국
- ☐ 뉴질랜드
- ☐ 인도네시아
- ☐ 일본

- 버마
- 태국
- 말레이시아
- 캄보디아
- 필리핀
- 기타(구체적으로 명시하여 주십시오) _____

Q24 당신 뉴질랜드에 처음 온 것은 언제입니까?

뉴질랜드에서 태어나지 않았다면 뉴질랜드에 도착한 년도를 아래의 박스에
써주십시오.

Q25 일상생활의 대화에서 사용하는 언어는 무엇입니까? *사용하는 언어에 표시하여
주십시오.*

- ☐ 만다린
- ☐ 한국어
- ☐ 광둥어
- ☐ 영어
- ☐ 기타(구체적으로 명시하여 주십시오) _____

Q26 당신의 최종학력은 무엇입니까? *(하나의 답에만 표시하여 주십시오)*

- (1) 초등학교 (2) 중학교 (3) 고등학교
- (4) 학부생 (5) 디플로마 (6) 학사
- (7) 대학원 이상 (8) 직업훈련 (9) 무학

Q27 고등학교 졸업증, 수료하지 않은 자격증과 3개월 이하의 풀타임 자격증을
제외하고을 다른 자격증을 갖고 계십니까? *최고학력에만 표시하여 주십시오.*

- ☐ 학사학위e.g. 인문학사, 이학사, 법학사
- ☐ 우등 학사 Bachelors degree with honors
- ☐ 석사학위e.g. 인문석사, 이공계 석사, 박사학위

- ☐ 디플로마 (대학원과정 제외)
- ☐ 디플로마- (대학원과정)
- ☐ 기술 자격증 (3개월 이상의 풀타임 과정)
- ☐ 전문 자격증 (회계사, 간호사, 교사)
- ☐ 고등학교 졸업장외에 자격증 없음
- ☐ 기타(구체적으로 명시하여 주십시오) _____

위의 질문들과 관련하여 의견이 있으시면 아래의 난에 여러분의 의견을 써주십시오:

질문지에 답하여 주셔서 감사합니다. 질문지와 동의서를 회수용 봉투에 동봉하여
우체통에 넣어 연구자에게 보내주시면 감사하겠습니다.

INFORMATION SHEET

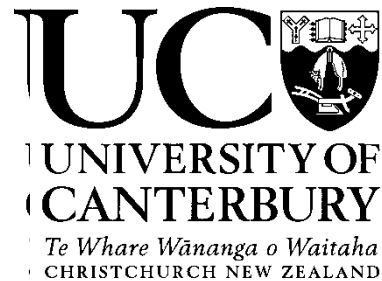
APPENDIX D: Study Information Sheet: English

Health Sciences Centre
University of Canterbury
Private Bag 4800
Christchurch 8140

Tel: +64 3 366 7001

Fax: + 64 3 364 2490

Email: healthsciences@canterbury.ac.nz



Attitudes of New Zealand Korean and Chinese ethnic cultural groups towards sharing of their health information in electronic health records in Christchurch.

Principal Investigator: Annette Mharakurwa Hwata; Health Sciences Centre, University of Canterbury, phone +64 3 366 7001 ext 8691 at the university. E-mail: Annette.mharakurwahwata@pg.canterbury.ac.nz

Supervisors of the study: Associate Professor Ray Kirk, Director of Health Science Centre, phone: +64 3 366 7001 ext 8691, Annabel Ahuriri-Driscoll, phone +64 3 366 7001 ext 8691, Health Sciences Centre, University of Canterbury, Private Bag 4800, Christchurch.

Introduction to the project:

You are invited to take part in a study conducted by the University of Canterbury. The study investigates the attitudes of New Zealand Koreans and Chinese ethnic cultural groups about sharing their health information in electronic health records in Christchurch.

Why is this study taking place?

The aims of the study are to analyse attitudes of New Zealand Koreans and Chinese ethnic cultural groups towards sharing their health information and to find out how well informed they are about the uses of their health information.

We hope that this information will be used to inform health funders and planners about the health status of New Zealand Koreans and Chinese ethnic cultural groups. You do not have to take part in this study if you choose and you may withdraw from the study at any time but your information is important to us.

Participants:

People aged 18 years and over can participate in this study if they are New Zealand resident Chinese and New Zealand resident Koreans.

How many participants will be involved?

We hope that 300 to 400 participants will answer the questionnaire.

Procedure:

You are asked to complete a survey questionnaire and it will take about 15 to 20 minutes.

Risks or Benefits

There will be no direct risks to you as a participant. The benefit is that your information will help health care providers to better understand the attitudes of OTHER ethnic cultural groups in sharing their health information in Electronic Health Records.

Participant rights

Are you obliged to take part?

Your participation is entirely voluntary (your choice). If you agree to participate, you are free to withdraw up until the submission of the survey in written or electronic form. There will be no disadvantages to you. If you decide to participate, you will be asked to sign a consent form to confirm your willingness to be involved.

Who do I contact if I have any concerns about this research?

If you have concerns about this research, contact:

Dr Michael Grimshaw

Chair, Human Ethics Committee

University of Canterbury

E-mail: michael.grimshaw@canterbury.ac.nz

What if there is a problem? (new heading)

If you feel stressed by answering any of the questions the researcher will offer to arrange appropriate assistance or you can contact the Health Line for advice on 0800 611 116. (new)

If you have any queries or concerns regarding your rights as a participant in this study, you may wish to contact an independent Health and Disability Advocate, South Island 0800 377

766 Free Fax (NZ wide) 0800 2787 7678 (0800 2 SUPPORT). E-mail: (NZ wide) advocate@hdc.org.nz

(The above statement was previously under the heading **Rview**)

Confidentiality

What will happen to the information collected?

Your name and personal details are strictly confidential and will not be mentioned in the final report. Every participant will be given a study number; no names will be used. All the information will be kept at Dovedale Village at the University of Canterbury.

Only the principal researcher and the two supervisors will have access to it to enable the information to be analysed. Completed questionnaires will be stored in a locked cabinet in the researcher's office at Dovedale Village.

Data will be stored on the researcher's password protected computer. At the end of the study the data will be kept securely by the Health Sciences Centre for 5 years. After 5 years, the data will be destroyed.

The results of the study may be published, but you may be assured of the complete confidentiality of data gathered in this investigation. Your participation and any comments you make will remain confidential.

Results

The final writing of the results is expected to be completed by the end of June 2012. If you wish, you will receive the copy of the summary of results.

Questions

If you require any further information about this study you are free to contact the principal investigator or the research supervisor.

The Principal investigator, Annette Mharakurwa Hwata, University of Canterbury, +64 3 366 7001 ext 8691 or via email, annette.mharakurwahwata@pg.canterbury.ac.nz

The research supervisor, Assoc Prof. Ray Kirk during working hours on, +64 3 364 3108 or via email: ray.kirk@canterbury.ac.nz

Who pays for the research?

This study is funded by the University of Canterbury.

Review

This research study has received ethical approval from University of Canterbury Health Sciences Centre and the University of Canterbury Human Ethics Committee, (UCHEC).

Online Version of the Survey

If you want to complete the survey online on your computer, use this link to go to the survey: <http://bit.ly/attitudessurvey>

We appreciate your willingness to take part in this study and for taking time to read this information sheet.

APPENDIX E: Study Information Sheet

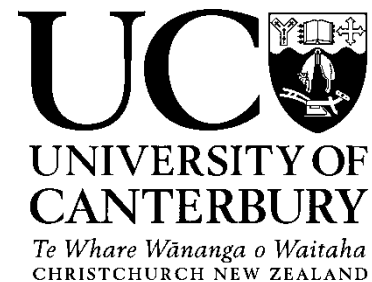
Simple Chinese version

Health Sciences Centre
University of Canterbury
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Date <insert date>

信息单

基督城的亚洲及其他少数民族文化群体针对分享储存于电子健康记录中的他们的健康信息的态度

主调查员: Annette Mharakurwa Hwata; 健康科学中心 (Health Sciences Centre), 坎特伯雷大学 (University of Canterbury)。电话03- 366 7001 大学加拨号 8691。

电子邮件: Annette.mharakurwahwata@pg.canterbury.ac.nz

调查监督员: Associate Professor Ray Kirk, 健康科学中心主任 (Director of Health Science Centre), 电话: +64 3 366 7001 加拨号 8691, Annabel Ahuriri-Driscoll, 电话 366 7001 加拨号 8691, 健康科学中心 (Health Sciences Centre), 坎特伯雷大学 (University of Canterbury), Private Bag 4800, Christchurch.

调查简介:

你被邀请参加由坎特伯雷大学所进行的一项调查。它是用来调查基督城的亚洲和其他少数民族文化群体在分享储存于电子健康记录中的他们的健康信息方面的态度。

为什么进行这项调查?

这项调查的目的是为了分析少数民族文化群体在分享他们的健康信息上的态度, 以及查明少数民族文化群体对于他们的健康信息的被使用的认知程度。

我们希望这些信息会有助于健康资金提供者和健康计划者了解新西兰的少数民族文化群体的健康状况—主要集中于新西兰的亚洲人中。你可以选择是否参加本次调查，而且可以随时退出调查，但是你的信息投入对我们很重要。

参与者：

调查参与者必须是18岁或18岁以上的持新西兰永久居民身份的中国人和韩国人。

需要多少参与者？

我们希望300—400人会参与问卷调查。

程序：

你只需填一份问卷调查，大约需要15—20分钟。

利与弊

作为参与者，你不会有直接的不利。好处是你的信息投入会帮助健康保健提供者更好地了解其他少数民族文化群体在分享储存于电子健康记录中的他们的健康信息上的态度。

参与者的权利

你被强迫参加吗？

你的参与是完全自愿的（你的选择）。如果你同意参与，在书面或电子调查结果递交之前，你随时都可以退出，而且对你不会有任何不利。如果你同意参与，你需要填一份同意书以证明你愿意参加。

如果我对这项调查有任何忧虑，与谁联系？

如果你对这项调查有任何忧虑，请联系：

Dr Michael Grimshaw

Chair, Human Ethics Committee

University of Canterbury

电子邮件：michael.grimshaw@canterbury.ac.nz

如何处理调查中出现的问题？

如果你在回答问题时有任何压力，调查员会提供安排一定的帮助，或者你可以征求健康热线的意见：0800 611 116

关于本次调查中参与者的权利方面，如果你有任何问题或忧虑，可以联系独立的 Health and Disability Advocate, 南岛电话：0800 377 766 。免费传真 (新西兰境内)：0800 2787 7678 (0800 2 SUPPORT)。电子邮件：(新西兰境内) advocate@hdc.org.nz

保密性

如何处理所收集到的信息？

你的名字和个人资料会被严格保密，并且不会在最后的报告中提到。你的名字会用数字代替。所有信息都会被保存在坎特伯雷大学的Dovedale Village。

只有主调查员和两位监督人员有资格阅读和分析信息。完成的问卷会被储存在Dovedale Village调查员办公室上锁的储藏柜里。

数据会被保存在调查员的密码保护的电脑中。在调查结束后，数据会被安全地保存在健康科学中心5年。5年后数据会被销毁。

调查的结果也许会被发表。但是我们可以保证本次调查中所有收集的数据的完全保密性。你的参与和你所做出的任何评论都是保密的。

结果

希望在2012年6月底会写出调查结果报告。如果你希望知道调查结果，你会收到一份总结报告。

问题

如果你想知道更多关于本次调查的信息，你可以随时联系主调查员或调查监督员。主调查员, Annette Mharakurwa Hwata, University of Canterbury, (03) 366 7001 加拨号 8691 或通过电子邮件, annette.mharakurwahwata@pg.canterbury.ac.nz

调查监督员, Assoc Prof. Ray Kirk, 工作时间电话：(03) 364 3108 ， 或通过电子邮件: ray.kirk@canterbury.ac.nz

谁提供调查所需资金？

本次调查是由坎特伯雷大学提供资金。

审查

本次调查已经收到由坎特伯雷大学健康科学中心和坎特伯雷大学人类道德委员会（UCH EC）的道德批准。

问卷调查网上版本

如果你想在网完成问卷调查，请用下面链条进入问卷：

<http://bit.ly/attitudessurvey>

我们非常感谢您愿意参加本次调查，并且抽出时间阅读本信息单。

APPENDIX F: Study Information Sheet – Korean version

정보지

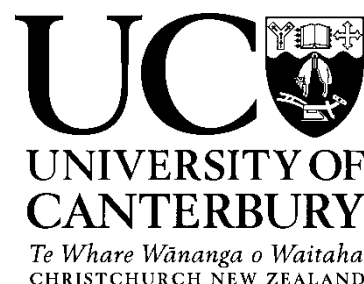
헬스사이언스 센터

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Private Bag 4800
Christchurch 8140

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팩스: + 64 3 364 2490

이메일: healthsciences@canterbury.ac.nz



날짜 <insert date>

INFORMATION SHEET

뉴질랜드의 아시안과 소수 민족 문화 그룹의 크라이스트 처치 전자 건강 기록을 통한 건강 정보 공유에 대한 태도

담당 연구원: Annette Mharakurwa Hwata; Health Sciences Centre, University of Canterbury,
전화 03- 366 7001 ext 8691 at the university.

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연구 감독원: Associate Professor Ray Kirk, Director of Health Science Centre, 전화: +64 3
366 7001 ext 8691, Annabel Ahuriri-Driscoll, 전화 366 7001 ext 8691, Health Sciences Centre,
University of Canterbury, Private Bag 4800, Christchurch.

프로젝트 소개

여러분은 캔터베리 대학에서 시행하는 연구의 참여에 초대 받으셨습니다. 이 연구는
뉴질랜드의 아시안과 소수 민족 문화 그룹의 크라이스트 처치 전자 건강 기록을 통한
건강 정보 공유에 대한 태도에 대하여 조사하는 연구입니다.

프로젝트의 목적

이 연구는 소수 민족 문화 건강 정보 공유에 대한 태도에 대하여 분석하고 소수 민족 문화 그룹이 얼마나 자신의 건강 정보의 이용에 대하여 알고 있는지에 대한 연구입니다.

우리는 이 연구의 결과가 건강 자금 제공자들과 기획 설계자들에게 뉴질랜드에 살고 있는 소수 민족 문화 그룹들의 건강 상태에 대한 정보를 제공하는 것을 희망하고 있습니다. 여러분이 원치 않을 경우 참여하지 않으셔도 되며, 참여 중에도 언제든지 참여를 철회할 수 있습니다. 그러나 여러분께서 제공하여 주시는 정보는 저희들에게 매우 소중한 것입니다.

참여대상 : 18세 이상의 중국인 또는 한국인 주민.

참여 인원: 300명 에서 400명의 참여자.

연구절차:

여러분은 15분에서 20분 정도 시간이 걸리는 설문지에 답하여 주시면 됩니다.

참여의 위험 또는 이득

참여에 따른 위험은 없으며 여러분의 정보는 건강 서비스 제공자들이 뉴질랜드의 아시안과 소수 민족 문화 그룹의 크라이스트 처치 전자 건강 기록을 통한 건강 정보 공유에 대한 태도에 대하여 더욱 깊은 이해를 도울 수 있습니다.

참여자의 권리

참여할 의무가 있는가?

여러분의 참여는 전적인 자발적인 선택으로 이루어 집니다. 참여에 동의하신 후 언제든지 원하시면 철회하실 수 있으며 철회의 이유를 묻지않으며 불이익은 없습니다. 참여를 결정하시면 참여동의서에 서명해 주시면 됩니다.

이 연구와 관련한 우려가 있을 경우 누구와 연락하면 됩니까?

이 연구와 관련하여 우려가 있을 경우 아래로 연락하시면 됩니다:

Dr Michael Grimshaw

인간 윤리 위원회 의장

캔터베리 대학

E-mail: michael.grimshaw@canterbury.ac.nz

비밀보장

수집된 정보는 어떻게 합니까?

여러분의 성명과 개인정보는 엄격하게 비밀로 보장되며 연구 보고서에 언급되지 않습니다. 모든 연구의 참여자는 연구 번호를 받게 되며 여러분의 이름은 연구에 언급되지 않습니다. 수집된 모든 정보는 캔터베리 대학의 헬스 사이언스 센터에서 보관합니다.

담당 연구원과 연구 감독원만이 연구 분석을 위하여 정보에 접근할 수 있습니다. 수집된 설문지는 연구원 사무실의 잠금 장치가 되어있는 캐비닛에 보관합니다.

수집된 데이터는 연구원의 비밀번호로 보호되는 컴퓨터에 저장되면 연구가 끝나면 헬스 사이언스 센터에 10년 동안 안전하게 보관됩니다. 10년 후에 데이터는 파기됩니다.

연구의 결과는 출판될 수 있으나 조사를 통하여 수집된 정보는 확실히 비밀로 보관되며 여러분의 참여와 견해는 비밀이 보장됩니다.

연구결과

최종 연구 결과는 2012년 6월 말까지 완료될 것으로 예상됩니다. 연구 결과의 사본을 원하시면 연구의 개요를 받아보실 수 있습니다.

질 문

이 연구와 관련한 더 자세한내용을 원하시면 담당연구원이나 연구감독원에게 연락하시기 바랍니다.

담당 연구원, Annette Mharakurwa Hwata, University of Canterbury, (03) 366 7001 ext 8691 or via email, annette.mharakurwahwata@pg.canterbury.ac.nz

연구 감독원, Assoc Prof. Ray Kirk 근무 시간 중 연락처 (03) 364 3108 or via email: ray.kirk@canterbury.ac.nz

누가 연구비를 지원하는가?

이 연구는 캔터베리 대학의 원조로 시행됩니다.

심리 검토

이연구는 캔터베리 대학 헬스 사이언스 센터와 캔터베리 대학의 인간 윤리 위원회(UCHEC)의 윤리적 인가를 받았습니다.

여러분의 참여자로서의 권리에 대한 질문이나 우려가 있으시면 독립적인 기관인 Health and Disability Advocate, South Island 으로 연락하실 수 있습니다. 연락처는 다음과 같습니다. 0800 377 766 Free Fax (NZ wide) 0800 2787 7678 (0800 2 SUPPORT). E-mail: (NZ wide) advocate@hdc.org.nz

온라인으로 연구에 참여하시기를 원하시는 분은 아래의 링크를 이용하여 주시기 바랍니다: <http://bit.ly/attitudessurvey>

여러분의 참여와 정보지를 읽어주심에 시간을 할애하여 주신 것에 진심으로 감사드립니다.

Appendix G. Summary of Chi-Square test results

Health practitioner/gender: $\chi^2 = 0.23, df = 1, p = 0.631$

Health practitioner/age: $\chi^2 = 20.67, df = 4, p = 0.001$ (Figure 7.45)

Choice of practitioner/gender: $\chi^2 = 0.231, df = 1, p = 0.631$ (Figure 7.46)

Tests/examinations/gender: $\chi^2 = 0.09, df = 8, p > 0.05$ (Figure 7.47)

Mobility/gender: $\chi^2 = 1.001, df = 1, p = 0.316$

Mobility/age: $\chi^2 = 44.72, df = 4, p = 0.001$ (Figure 7.48)

Self-care/gender: $\chi^2 = 1.31, df = 1, p = 0.252$

Self-care/age: $\chi^2 = 14.07, df = 4, p = 0.007$ (Figure 7.49)

Usual activities/gender: $\chi^2 = 0.88, df = 1, p = 0.35$

Usual activities/age: $\chi^2 = 36.37, df = 4, p = 0.001$ (Figure 7.50)

Pain/discomfort/gender: $\chi^2 = 0.215, df = 1, p = 0.643$

Pain/discomfort/age: $\chi^2 = 28.31, df = 4, p = 0.001$ (Figure 7.51)

Anxiety/depression/gender: $\chi^2 = 0.15, df = 1, p = 0.696$

Anxiety/depression/age: $\chi^2 = 8.51, df = 6, p = 0.203$

Health state/gender: $\chi^2 = 30.80, df = 27, p = 0.279$

Health state/age: $\chi^2 = 119.77, df = 108, p = 0.207$

CAM use/gender: $\chi^2 = 19.49, df = 8, p = 0.012$ (Figure 7.52)

CAM use/age: $\chi^2 = 18.12, df = 8, p = 0.020$ (Figure 7.53)

Computer use/age: $\chi^2 = 74.28, df = 16, p = 0.001$ (Figure 7.54)

Computer use/gender: $\chi^2 = 2.55, df = 4, p = 0.635$

E-mail use/age: $\chi^2 = 29.93, df = 16, p = 0.018$ (Figure 7.55)

E-mail use/gender: $\chi^2 = 1.52, df = 4, p = 0.823$

Internet use/age: $\chi^2 = 44.14, df = 16, p = 0.001$ (Figure 7.56)

Internet use/gender: $\chi^2 = 4.94, df = 4, p = 0.293$

Internet purchases/age: $\chi^2 = 34.99, df = 16, p = 0.004$ (Figure 7.57)

Internet purchases/gender: $\chi^2 = 8.18, df = 4, p = 0.085$

Security/age: $\chi^2 = 13.55, df = 12, p = 0.330$

Security/gender: $\chi^2 = 4.78, df = 3, p = 0.189$

NHI/age: $\chi^2 = 8.19, df = 8, p = 0.415$

NHI/gender: $\chi^2 = 2.37, df = 2, p = 0.305$

EHR awareness/age: $\chi^2 = 6.75, df = 4, p = 0.150$

EHR awareness/gender: $\chi^2 = 4.21, df = 1, p = 0.040$ (Figure 7.58)

Access benefit/age: $\chi^2 = 18.06, df = 16, p = 0.320$

Access benefit/gender: $\chi^2 = 3.03, df = 4, p = 0.553$

Health practitioner access/age: $\chi^2 = 18.75, df = 16, p = 0.282$

Health practitioner access/gender: $\chi^2 = 5.54, df = 4, p = 0.236$

Anytime medical history/age: $\chi^2 = 23.06, df = 16, p = 0.112$

Anytime medical history/gender: $\chi^2 = 4.09, df = 4, p = 0.395$

Current prescriptions/dosages/age: $\chi^2 = 23.65, df = 16, p = 0.097$

Current prescriptions/dosages/gender: $\chi^2 = 3.20, df = 4, p = 0.525$

Recent test results/age: $\chi^2 = 34.33, df = 16, p = 0.005$ (Figure 7.59)

Recent test results/gender: $\chi^2 = 3.07, df = 4, p = 0.547$

Quicker test results/age: $\chi^2 = 28.19, df = 16, p = 0.030$ (Figure 7.60)

Quicker test results/gender: $\chi^2 = 0.58, df = 4, p = 0.965$

Fewer lost records/results/age: $\chi^2 = 50.41, df = 16, p = 0.001$ (Figure 7.61)

Fewer lost records/results/gender: $\chi^2 = 1.06, df = 4, p = 0.901$

Who can see health records/age: $\chi^2 = 33.85, df = 16, p = 0.006$ (Figure 7.62)

Who can see health records/gender: $\chi^2 = 4.00, df = 4, p = 0.406$

Make/change appointments online/age: $\chi^2 = 27.76, df = 16, p = 0.019$ (Figure 7.63)

Make/change appointments online/gender: $\chi^2 = 4.82, df = 4, p = 0.306$

Recording individual wishes/age: $\chi^2 = 30.47, df = 16, p = 0.016$ (Figure 7.64)

Recording individual wishes/gender: $\chi^2 = 0.459, df = 4, p = 0.977$

Medical errors/age: $\chi^2 = 14.31, df = 16, p = 0.576$

Medical errors/gender: $\chi^2 = 3.36, df = 4, p = 0.499$

Leaking information/age: $\chi^2 = 28.72, df = 16, p = 0.026$ (Figure 7.65)

Leaking information/gender: $\chi^2 = 6.33, df = 4, p = 0.176$

Sharing medical information/age: $\chi^2 = 19.72, df = 16, p = 0.233$

Sharing medical information/gender: $\chi^2 = 7.62, df = 4, p = 0.106$

Insufficient data security/age: $\chi^2 = 28.38, df = 16, p = 0.021$ (Figure 7.66)

Insufficient data security/gender: $\chi^2 = 5.09, df = 4, p = 0.278$

Malicious software/age: $\chi^2 = 24.76, df = 16, p = 0.074$

Malicious software/gender: $\chi^2 = 8.26, df = 4, p = 0.083$

Vendor access/age: $\chi^2 = 27.47, df = 16, p = 0.037$ (Figure 7.67)

Vendor access/gender: $\chi^2 = 6.87, df = 4, p = 0.143$

Long-term accessibility/age: $\chi^2 = 37.70, df = 16, p = 0.002$ (Figure 7.68)

Long-term accessibility/gender: $\chi^2 = 4.33, df = 4, p = 0.363$

Deliberate harm/age: $\chi^2 = 27.06, df = 16, p = 0.041$ (Figure 7.69)

Deliberate harm/gender: $\chi^2 = 9.11, df = 4, p = 0.058$

Failed backup/age: $\chi^2 = 19.19, df = 16, p = 0.259$

Failed backup/gender: $\chi^2 = 2.23, df = 4, p = 0.693$

Anti-virus software/age: $\chi^2 = 30.42, df = 16, p = 0.016$ (Figure 7.70)

Anti-virus software/gender: $\chi^2 = 3.23, df = 4, p = 0.521$

Firewalls/age: $\chi^2 = 31.48, df = 16, p = 0.012$ (Figure 7.106) (Figure 7.71)

Firewalls/gender: $\chi^2 = 5.76, df = 4, p = 0.217$

Restricted access/age: $\chi^2 = 34.19, df = 16, p = 0.005$ (Figure 7.72)

Restricted access/gender: $\chi^2 = 8.01, df = 4, p = 0.091$

Audit trails/age: $\chi^2 = 36.74, df = 16, p = 0.002$ (Figure 7.73)

Audit trails/gender: $\chi^2 = 3.79, df = 4, p = 0.435$

Encryption/age: $\chi^2 = 36.68, df = 16, p = 0.002$ (Figure 7.74)

Encryption/gender: $\chi^2 = 2.95, df = 4, p = 0.566$

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